SR&ED
Scientific Research & Experimental Development Tax Credits

Practitioner workshop
September 25, 2013

 Practitioner Workshop Sept 25, 2013

SR&ED Practitioner meeting issues 2013	PDF	Video
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Airmax Technologies (2 issues) Issue 1) SR&ED eligibility of HVAC improvements - win Issue 2) informal appeal $12K limit	**Link**	**Link**
Cal Amp – bonuses linked to SR&ED - loss Lyrtek – CCPC status & defacto control - loss Immunovaccine – if SR&ED loan "government assistance" - loss	**Link**	**Link**
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New CRA software example (Nov. 2012)	**Link**	**Link**
10 New CRA SR&ED project examples (Sept 18, 2013)	**Link**	**Link**
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September 25, 2013 SR&ED Practitioner meeting minutes

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Airmax - issue 1- SR&ED eligibility

ISSUE:

- ELIGIBLE WORK: During the 2007 taxation year SR&ED activities focused on the design of a quieter air diffuser. The Minister accepted that this work was eligible SR&ED.
- INELIGIBLE WORK: To reduce noise levels further, the appellant undertook testing of the flexible duct used as the conduit to move the hot air generated at the heating source. The appellant put holes in the core of the flexible duct for that purpose, experimented with the size, number and position of the holes, and adopted those variables which reduced noise levels the most

WIN/LOSE: Win

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Airmax - issue 1- SR&ED eligibility

RULING /RATIONALE: The judge commented:

- "The evidence shows that the system was unique in the market insofar as it utilized:
- - Higher than usual pressure in response to narrower duct work used in narrow multi-storey townhouses &
- - an unconventional heat source unlike more commonly used indirect-fired furnaces &
- - there was technological uncertainty with respect not only to noise, but also to space & efficiency with those types of systems."

IMPLICATIONS: Basis for project example in HVAC industry

SIGNIFICANCE: High

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Airmax – project description with comments on eligibility

Project Details:

Scientific or Technological Objectives:

Measurement	Current Performance	Objective	Has results?
Footprint (m2)	20	5	Yes
Cost ($)	60000	25000	Yes
Noise (DB)	60	20	Yes
Constant Static pressure (% variance)	10	1	Yes
Ventilation rate (CFM/occupant)	20	25	Yes
Air mixing % (Ev) (%)	60	80	Yes
CO2 concentrations (PPM)	800	600	Yes
SEER (efficiency rating) (rating)	10	12	Yes

[NOTE: THIS PROJECT EXAMPLE IS REPRODUCED FROM DETAILS PROVIDED IN THE TAX COURT OF CANADA RULING ON AIRMAX TECHNOLOGIES, 2012 (TCC) 376. Copies of the judgment are available from the Tax Court of Canada website [www.tcc-cci.gc.ca].

SINCE THE MOTION WAS AN INFORMAL APPEAL THERE WAS ONLY SUMMARY EVIDENCE PROVIDED AT THE TRIAL.

AS A RESULT WE HAVE ADDED ADDITIONAL GUIDANCE & EXAMPLES OF POTENTIALLY ELIGIBLE WORK IN THE AIR DISTIBUTION INDUSTRY.

In addition to the claimants own cost & performance goals there may be additional objectives created by;

- ASHRAE or other industry standards eg. for air quality / ventilation rates

As illustrated in this example it is important to list all significant & QUANTIFIABLE objectives since they tend to "stack up" or combine to create the technological uncertainties.

Technology or Knowledge Base Level:

Benchmarking methods & sources for citings:

Benchmark Method/Source	Measurement	Explanatory notes
Internet searches	8 sites / articles	8 articles outlining design methods of similar systems were discovered but none met the stated objectives.
Patent searches	14 patents	14 different patents were examined regarding both component design & concepts to integrate entire systems.
Competitive products or processes	12 products	Concepts from 12 competitive systems were examined.
Similar prior in-house technologies	3 products / processes	
Potential components	55 products	
Queries to experts	4 responses	received 4 responses via HVAC industry blogs re. alternate part designs

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DEPARTURES FROM STANDARD PRACTICE:

The design of this system was unique in the market insofar as it utilized higher than usual pressure in response to the problem of the narrower duct work used in narrow multi-storey townhouses.

It also contemplated using an unconventional heat source that also provided domestic hot water, unlike those more commonly used indirect-fired furnaces.

AUTHOR'S NOTE: IDEALLY THE CLAIMANT WOULD ATTEMPT TO OUTLINE ALL:

- "DUE DILIGENCE" PERFORMED IN ORDER TO
- "BENCHMARK" THE LEVEL OF TECHNOLOGY WHICH WOULD BE
- "READILY AVAILABLE TO SOMEONE SKILLED IN THE ART."

THE CRA AND COURTS REFER TO THIS AS "STANDARD PRACTICE" FOR THE INDUSTRY.

THERE IS NO MINIMUM REQUIRED LEVEL OTHER THAN IT IS "REASONABLE WITHIN THE BUSINESS CONTEXT OF THE FIRM."

Field of Science/Technology:

Thermodynamics (2.03.03)

Scientific or Technological Advancement:

Uncertainty #1: component design & integration

We have attempted to list examples of

- the top 5 variables of experimentation along with
- an outline of potential issues (or sub-variables) to be investigated

In addition to those listed experimental development in this and similar HVAC areas may include contemplation of:

- manifold pressures vs. BTU inputs
- warm vs. cold air systems
- constant vs. variable air volumes

The most significant underlying key variables are:

- Coil - shape, depth, location,
- Components - diffuser vs. ducts vs. boiler vs. ECM,
- Spacing - components, duct vents,
- Diffuser - shape, aspiration rate, location,
- Duct - holes: size, # & position, material, shape (unresolved)

Key Criteria Summary

R&D Base demo

1201 - Airmax (2012 TCC Case) - HVAC development

Benchmarks:
Internet searches: 8 sites / articles
Patent searches: 14 patents
Competitive products or processes: 12 products
Similar prior in-house technologies: 3 products /
Potential components: 55 products
Queries to experts: 4 responses

Objectives:
Footprint: 5 m2
Cost: 25000 $
Noise: 20 DB
Constant Static pressure: 1 % variance
Ventilation rate: 25 CFM/occupant
Air mixing % (Ev): 80 %
CO2 concentrations: 600 PPM
SEER (efficiency rating): 12 rating

Uncertainty: 1 - component design & integration

Key Variables: Coil - shape, depth, location, Components - diffuser vs. ducts vs. boiler vs. ECM, Diffuser - shape, aspiration rate, location, Duct - holes:size, # & position, material, shape, Spacing - components, duct vents

Activity	Testing Methods	Results - % of Objective	Variables Concluded	Hours	Materials $	Subcontractor $	Fiscal Year
1 - Diffuser (accepted by CRA)	Analysis / simulation: 100 alternatives Process trials: 10 runs / samples Physical prototypes: 10 samples ... prototype revisions: 50 revisions	Noise: 40 DB (50 %) Air mixing % (Ev): 75 % (75 %)	Diffuser - shape, aspiration rate, location	1,250.00	0.00	0.00	2012
2 - Duct (Challenged by CRA)	Analysis / simulation: 100 alternatives Process trials: 12 runs / samples	Ventilation rate: 23 CFM/occupant (60 %) Noise: 32 DB (70 %) Air mixing % (Ev): 77 % (85 %)	Duct - holes:size, # & position, material, shape Spacing - components, duct vents	1,000.00	0.00	0.00	2012
3 - Furnace ECM x-n (challenged)	Analysis / simulation: 100 alternatives Process trials: 50 runs / samples	Footprint: 7 m2 (86 %) Cost: 30000 $ (85 %) Noise: 25 DB (87 %) Constant Static pressure: 0.5 % variance (105 %) Ventilation rate: 28 CFM/occupant (160 %) Air mixing % (Ev): 86 % (130 %) CO2 concentrations: 850 PPM (-25 %) SEER (efficiency rating): 12 rating (100 %)	Coil - shape, depth, location Components - diffuser vs. ducts vs. boiler vs. ECM Spacing - components, duct vents	500.00	0.00	0.00	2013

The RDBASE.NET SR&ED Consortium 8 ©2012

Recent SR&ED Tax Cases & Related Issues

Copies of the judgment are available from the Tax Court of Canada website.[1]

Airmax Technologies – eligibility of HVAC improvement

Facts:

The appellant, 1726437 Ontario Inc. o/a Airmax Technologies, is an installer of heating, ventilation and air conditioning systems in residential homes.

STANDARD PRACTICE: At the time it began its development work, the appellant had determined that existing HVAC systems used for townhouse installations did not operate efficiently. The systems that were on the market at the time did not distribute heating evenly throughout the living space of multi-storey townhouses and they operated at high noise levels.

OBJECTIVES: The appellant set out to correct these problems with the development of a new HVAC system.

The appellant set the following technological objectives for the overall system:

(1) Achieving a sound level reduction from 60 to 40 dB;
(2) Achieving constant static pressure;
(3) Adapting a foreign boiler to meet North American standards;
(4) Achieving the required BTUs,
(5) Adapting an electronically commutated motor (ECM) for use in the system.

In 2007 and 2008, the appellant worked on an SR&ED project named "High Static High Velocity Fan Coil System Development" ("HVAC System").

ELIGIBLE WORK: During the 2007 taxation year SR&ED activities focused on the design of a quieter air diffuser. The Minister accepted that this work was eligible SR&ED.

INELGIBLE WORK: To reduce noise levels further, the appellant undertook testing of the flexible duct used as the conduit to move the hot air generated at the heating source. The appellant put holes in the core of the flexible duct for that purpose, experimented with the size, number and position of the holes, and adopted those variables which reduced noise levels the most.

In 2008, the appellant incurred expenses to bring a European-sourced boiler into conformity with North American standards & undertook testing of ECMs to ensure that they could be programmed at the speeds necessary to meet the design requirements

The Minister of National Revenue (the "Minister") disallowed most of the expenses claimed by the appellant on the grounds that the activities constituted **routine engineering.**

Issues:

1) Was the work SR&ED?

Other than those recognized as such by the Minister, did the appellant's activities in the 2007 and 2008 taxation years constitute SR&ED?

2) Effects of informal appeal

What are the consequences of the appellant's election to have its appeal heard under the informal procedure?

Relevant legislation and analysis:

1) Was the work SR&ED?

The definition of SR&ED[2] is based on a "catch and release" concept. The definition first includes a broad category of development activities under paragraphs (*a*) to (*c*), then items otherwise included are excluded under paragraphs (*e*) to (*k*).

The judge commented:

> "The evidence shows that the system was unique in the market insofar as it utilized:
>
> - Higher than usual pressure in response to narrower duct work used in narrow multi-storey townhouses &
>
> - an unconventional heat source unlike more commonly used indirect-fired furnaces &
>
> - there was **technological uncertainty** with respect not only to **noise, but also to space and efficiency** with those types of systems."

[1] Tax Court of Canada website [www.tcc-cci.gc.ca]

[2] ITA 248(1) - definition of Scientific Research & Experimental Development

2) Effects of informal appeal

The judge referred to the limits[3] under the Tax Court of Canada Act, which reads as follows:

> **"**Every judgment that allows an appeal referred to in subsection 18(1) shall be deemed to include a statement that the aggregate of all amounts in issue **not be reduced by more than $12,000** or that the amount of the loss in issue not be increased by more than $24,000, as the case may be."

Ruling & Rationale: WIN – variables of experimentation = hypotheses

The judge then ruled,

1) Was work SR&ED?

"Considering the evidence as a whole, I am of the opinion that the appellant has demonstrated that it maintained a level of **record-keeping** that illustrates that it **identified a problem, developed hypothetical solutions, tested them**, and modified its approach in **response to** the results."

2) Effects of informal appeal

"The amount of the appellant's additional refundable **ITCs for the 2008 taxation year is limited to $12,000** notwithstanding the fact that its qualified SR&ED expenditures for that year totaled $387,553."

Implications and author's commentary

1) Was work SR&ED?

Since this was an informal appeal it did not provide the degree of detail which we might see under a general procedure.

The judge sited the experimentation of the different variables as "hypothetical solutions."

In the author's opinion the **client would have had an easier time** if it had been able to:

-identify & rank the
-**key variables of uncertainty** / experimentation.

As a result, in the next section we have developed a **project rewrite** illustrating issues which might have been present in this or similar SR&ED projects.

2) Effects of informal appeal:

Claim limited to $12,000/year but decision within 1 year!

Despite the fact that the client would have been **entitled to** federal credits of ($387,553 x 35% = **$135,643**) under the general procedure the **settled for $12,000** under the informal procedure.

In effect they **settled for less that 10% of total credit**s in dispute, however, the following advantages of the informal vs. general procedure made this a necessary decision:

General Procedure (tax court)

- generally cost $40,000+
- require use of a lawyer (tax litigator)
- take 3+ years
- during which period all SR&ED claims will be held if similar issues

Informal Procedure (tax court)

- $100 application fee
- client or accountant can represent
- no lawyer required
- takes < 1 year
- limited to $12,000 / year
- **provides legal precedent for future years**

As a result there are few incentives & huge barriers to prevent taxpayers from using the general procedure no matter how much their claim has merit.

In the author's opinion the CRA desperately needs an arbitration method to get disputed claims settled **quickly.**

Sadly the informal procedure seems to be the best current method to achieve any type of "justice."

Recommendation: Until a better method is developed perhaps the **threshold amounts could be raised for SR&ED related claims**?

Notable quote:

"There is nothing wrong with change, if it is in the right direction"
- Sir Winston Churchill

[3] section 18.1 of the TCCA

Key Criteria Summary

R&D Base demo

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Benchmarks:

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Notable quote

"The more original a discovery, the more obvious it seems afterwards."

- Arthur Koestler

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Airmax - issue 2 – informal appeal limits

- ISSUE: informal appeal $12K limit / result in year
- IMPLICATIONS: strategy to deal with multi year or small issues – discussed later in this presentation
- SIGNIFICANCE: High
- **Recommendation:** Until a better method is developed perhaps the threshold amounts could be raised for SR&ED related claims?

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Cal Amp – SR&ED wages

- ISSUE: bonuses linked to SR&ED
- WIN/LOSE: loss
- RULING /RATIONALE: "***reasons for paying the bonuses*** *…sufficient* ***nexus with SR&ED****."*
- IMPLICATIONS: clarify if bonus SR&ED related
- SIGNIFICANCE: High

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Recent SR&ED tax cases

Cal Amp – bonuses linked to SR&ED - loss[1]

Facts

During the year the company (CalAmp) paid bonuses to employees of a company it had acquired (Old Dataradio).

According to the court the evidence reveals that the bonuses were paid mainly on the basis of two factors:

a) the belief by shareholders that salaried employees of an acquired company should share in the financial **success resulting from the sale of the company** &

b) the corresponding benefit to the purchaser CalAmp Corp. of creating conditions which would favour the **retention of employees** following its acquisition of Old Dataradio.

The CRA reduced ITC's by $131,260 on the basis that the amount $1,990,036 (bonuses paid to its employees engaged in SR&ED) didn't constitute an expenditure of SR&ED.

Issue

Whether the company is entitled to an investment tax credit ("ITC") in respect of bonuses paid to these employees engaged in "SR&ED"?

Legislation & analysis

Income Tax Act

Under the proxy method, such as in the present case, salary and wages for SR&ED purposes are allowed under the Income Tax Act, as follows:

"that **portion** of an expenditure made in respect of an expense incurred in the year for salary or wages of an employee who is directly engaged in scientific research and experimental development in Canada that can reasonably be **considered to relate** to such work having regard to the time spent by the employee thereon, […]"[2]

CRA Guidance

"SR&ED Salary or Wages Policy"[3], specifies that:

"There would be **no reasonable link** between the expenditure and the prosecution of SR&ED where, for example, an employee […] receives:

• salary, including a bonus, when the income that was used to pay the amount was not earned from the ongoing, normal activities of the business.

This would include an amount paid to an employee that was earned from a **capital transaction** such as the sale of the business, the sale of shares or the sale of an asset. […]"

Ruling & rationale (Judge's comment) - loss

"I must distinguish the method of calculating the bonuses from the reasons for paying the bonuses. The **reasons for paying the bonuses** will reveal whether there is a sufficient **nexus with SR&ED**.

In this case, the payment of the bonuses at issue was an isolated event and not the result of the application of Old Data radio's traditional policy in respect of Christmas bonuses.

[as a result], the Appellant has not shown the expenditures "as having a direct relationship with the research projects and also being essential to their completion[…]".

Author's comment: moderate significance

In the author's opinion this case shows the importance of **directly clarifying how any bonuses** to employees relate **to any related SR&ED** work performed.

Additional consideration should be taken to avoid structuring this remuneration as "royalties" or "commissions" which would also be excluded from SR&ED tax credit claims.[4]

[1] CalAmp Wireless Networks Inc. v. The Queen - 2013 TCC 201, Docket: 2010-3708(IT)G, June 25, 2013

[2] ITA subclause 37(8)(a)(ii)(B)(IV)

[3] SR&ED Salary or Wages Policy, Canada Revenue Agency: December 19, 2012

[4] ITA Regulation 2902 prescribed expenses

Lyrtek - CCPC status & defacto control - LOSS

FACTS:

- A public corporation, Lyrtech restructured its business in order to transfer its R&D activities to a new corporation, the appellant (Lyrtek RD Inc.)
- The majority of voting shares for Lyrtek RD Inc. were held in a trust. The trustees also controlled Lyrtek.
- Lyrtech determined what research work the appellant was to conduct
- The intellectual property resulting from this research work belonged to Lyrtech.
- For its research work, the appellant was entitled to receive only
  - 10% of the royalties on sale of products from research work &
  - 25% of the proceeds from licenses.

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Lyrtek - CCPC status & defacto control - LOSS

RULING /RATIONALE:

- "Lyrtech exercised a **dominant economic influence** over the appellant."

IMPLICATIONS:

- Need to reduce factors leading to "control"
- One key step would be to provide a cost plus basis which allowed the SR&ED performer to illustrate a "reasonable expectation of profit."
- See cases of "Mimetex" & "Bagtech" for ideas

SIGNIFICANCE: High

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Lyrtek – CCPC status & defacto control - loss[5]

Facts

As a public corporation, Lyrtech claimed against its tax payable non-refundable investment tax credits at the rate of 20% of its eligible R&D expenditure account.

In 2005, Lyrtech restructured its business in order to transfer its R&D activities to a new corporation, the appellant (Lyrtek RD Inc.)

The majority of voting shares for Lyrtek RD Inc. were held in a trust. The trustees also controlled Lyrtek.

The terms and conditions of the research contract between Lyrtech and the appellant.

- was of indeterminate duration but Lyrtech could terminate it on 60 days' notice without providing any reason.

-Lyrtech determined what research work the appellant was to conduct

- the intellectual property resulting from this research work belonged to Lyrtech.

- For its research work, the appellant was entitled to receive only
  - 10% of the royalties Lyrtech collected on the sale of products resulting from the research work &
  - 25% of the proceeds from licences granted by Lyrtech.

Issues

The issue is whether the appellant was a "Canadian-controlled private corporation", as defined in subsection 125(7) of the Act.

Legislation & analysis

"Canadian-controlled private corporation" means a private corporation that is a Canadian corporation **other than**

(a) a corporation **controlled**, directly or indirectly **in any manner whatever**, by one or more **non-resident** persons, by one or more **public corporations** … or by any combination of them,..."

Ruling & rationale (Judge's comment)- loss

"Taking all these facts into consideration, I find that Lyrtech exercised a **dominant economic influence** over the appellant.

The appellant was not an independent profit centre and could not survive or continue its activities without the financial support of Lyrtech.

The appellant could not finance itself without Lyrtech's help."

Author's comment: moderate significance

In the author's opinion the concept of a separate company to perform the SR&ED was clever however the necessary structuring and financing steps were not followed.

One key step would be to provide a cost plus basis which allowed the SR&ED performer to illustrate a "reasonable expectation of profit."

Much like a similar case (Mimetex pharmaceuticals), this case outlines the importance of structuring shareholders agreements to require a majority of the Canadian directors approval before making any major decisions.

Interestingly if such steps are taken these agreements may even override voting or "de jure" control held by foreign parties. See case of Bagtech[6] in newsletter 2012-4 for more details.

[5] LYRTECH RD INC.,vs. THE QUEEN, 2013 TCC 12, Docket: 2009-1057(IT)G, January 24, 2013

[6] PWC Trustee for BIOARTIFICIAL GEL TECHNOLOGIES (BAGTECH) INC v. The Queen - Tax Court of Canada, 2012 CCI 120, Apr. 4, 2012, Dossier : 2009-3734(IT)G

Immunovaccine – ACOA loan

- ISSUE: if repayable SR&ED loan "government assistance"
- WIN/LOSE: Loss
- RULING /RATIONALE: Income Tax Act

  "government assistance" means assistance from a government, municipality or other public authority whether as a grant, subsidy, **forgivable loan**, deduction from tax, investment allowance or as any other form of assistance…"

  - subsection 127(9) of the ITA
- IMPLICATIONS: R&D loans assistance – earn credits if / when repaid
- SIGNIFICANCE: High

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CRA "Assistance & Contract Payments Policy" Dec. 19, 2012

Definition of "contract payment" in subsection 127(9)

	Positive indicators	Negative indicators
i)	SR&ED Performance Required	Contract not explicit wrt SR&ED
ii)	Pricing based hourly	Pricing vs. Risks (ceiling)
iii)	Intellectual Property (IP) to client	IP to performer
iv)	Contract for Services	Contract for Goods

Immunovaccine – if repayable SR&ED loan "government assistance" - loss[7]

Facts

The appellant was incorporated in March 2000 as a research and development company to develop projects for the creation of vaccine technology.

The Atlantic Canada Opportunities Agency (ACOA) is a federal government funding agency which provided a contribution to the appellant of $3,786,474, spread over four years (2005 through 2008), in respect of costs incurred to complete such projects.

The Minister determined the appellant's entitlement to SR&ED tax credits on the basis that contributions received were "government assistance" within the meaning of subsection 127(9) of the ITA and reduced the claims accordingly.

Issues

The issue is whether the loans received by the appellant from ACOA were "government assistance" as defined in subsection 127(9) of the ITA.

Legislation & analysis

Income Tax Act

"government assistance" means assistance from a government, municipality or other public authority whether as a grant, subsidy, **forgivable loan**, deduction from tax, investment allowance or as any other form of assistance…"[8]

Analysis

The appellant's position is that the contribution from ACOA does not constitute government assistance within the meaning of but rather an ordinary loan advanced on reasonable terms for business purposes.

.

Ruling & rationale (Judge's comment) - loss

"…the inclusion of "forgivable loan" in the definition suggests that "government assistance" …. would reflect Parliament's intention to restrict access to tax relief for SRED expenditures and to RITCs where relief was provided in some other form.

Under such circumstances, it is reasonable to conclude that a contribution that is made by the government and is repayable may constitute "government assistance".

I therefore disagree with the appellant that the common factor linking the terms enumerated in the definition of "government assistance" is that each represents a transfer of funds advanced with no expectation of repayment."

Author's comment: low significance

In the author's opinion this case appeared somewhat frivolous and that the act is quite clear. Repayable loans which are issued for the purpose of research and development are to be treated as government assistance.

Having said this, the strategic issue in planning these contracts would be to tip the scale of risk to the performer instead of the government.

In other words **if the contractor assumes the majority of risk** for the SR&ED such payments will be treated as commercial payments rather than government assistance.

The **four criteria** will which the CRA and the tax courts will consider to determine whether such payment is "government assistance" include the following:

CRA "Assistance & Contract Payments Policy" Dec. 19, 2012

Definition of "contract payment" in subsection 127(9)

	Positive indicators	Negative indicators
i)	SR&ED Performance Required	Contract not explicit wrt SR&ED
ii)	Pricing based hourly	Pricing vs. Risks (ceiling)
iii)	Intellectual Property (IP) to client	IP to perfomer
iv)	Contract for Services	Contract for Goods

In this case the funding contract was not treating the funds as "pre-payment" by an "end user" for the eventual product since it had clear links to the SR&ED work.

[7] IMMUNOVACCINE TECHNOLOGIES INC. vs. THE QUEEN, 2013 TCC 103, Docket: 2011-245(IT)G, April 10, 2013

[8] subsection 127(9) of the ITA

II) New SR&ED measures proposed by parliament

- [Budget 2013 – new reporting on SR&ED preparer fees]
- [Tax Court of Canada informal appeal levels to rise]
- [Dispute resolution - formal vs. informal appeal strategies]
- [Status of current SR&ED legislation]

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Budget 2013 – new reporting on SR&ED preparer fees

Department of Finance,

"Budget 2013 introduces measures to provide the Canada Revenue Agency with new resources and administrative tools to better **respond to the minority of SR&ED program tax preparers** and SR&ED performers **who participate in claims** where the **risk of non-compliance** is perceived to be **high** and eligibility for the SR&ED program unlikely."

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Budget 2013 – new reporting on SR&ED preparer fees

Requirements

- the Business Number of each third party
- details about the billing arrangements including
- whether contingency fees were used &
- the amount of the fees payable **OR**
- Certify that no third party assisted in any aspect of the SR&ED preparation

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Budget 2013 – new reporting on SR&ED preparer fees

Author's comment: low significance

Due to the fact that certain journalist published articles which "falsely" claimed that:

- upwards of $1 billion / year
- is being paid to SR&ED consultants

The government has begun collecting information to confirm whether these accusations have any merit.

These results will likely be used to determine:

- whether billings which are "contingent" on the success of the claim are in the interest of all parties &
- if any further regulation is thereby required.

New SR&ED measures proposed by parliament

Budget 2013 – new reporting on SR&ED preparer fees

According to the Department of Finance,

> "Budget 2013 introduces measures to provide the Canada Revenue Agency with new resources and administrative tools to better respond to **the minority of** SR&ED program **tax preparers and SR&ED performers** who participate in claims where the **risk of non-compliance** is perceived to be **high** and eligibility for the SR&ED program unlikely."

Requirements

> In particular, in instances where one or more third parties have assisted with the preparation of a claim,
>
> - the Business Number of each third party
> - details about the billing arrangements including
> - whether contingency fees were used &
> - the amount of the fees payable.
>
> In instances where no third party was involved, the claimant will be required to certify that no third party assisted in any aspect of the preparation of the SR&ED program claim.

Penalty for non- compliance

> Budget 2013 proposes that a new penalty of
>
> -$1,000 be imposed in respect of
> - each SR&ED program claim for which
> - information about SR&ED program
> - tax preparers & billing arrangements is
> - missing, incomplete or inaccurate.
>
> The SR&ED program claimant and tax preparer will be jointly and severally liable for the penalty.

Timing of implementation

> This measure will apply to SR&ED program claims filed on or after the **later of January 1, 2014** and the day of Royal Assent to the enacting legislation.

Author's comment: low significance

> Due to the fact that certain journalist published articles which "falsely" claimed that:
>
> - upwards of $1 billion / year
>
> - is being paid to SR&ED consultants
>
> the government has begun collecting information on these fees to confirm or deny whether these accusations have any merit.
>
> These results will likely be used to determine:
>
> - whether billings which are "contingent" on the success of the claim are in the interest of all parties &
>
> - if any further regulation is thereby required.

Notable quote:

"Minds are like parachutes; they work best when open."

- T. Dewar

Tax Court of Canada informal appeal levels to rise

Overview

- Currently all judgments that allow appeals under the informal procedure are limited to
  - Taxes payable of $12,000, or
  - Taxable income of $24,000.

- Those amounts, $12,000 and $24,000, are increased to $25,000 and $50,000, respectively.

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Dispute resolution - formal vs. informal appeal strategies

Typical dispute resolution steps & timelines			
	Step	**Parties**	**Expected timeframe**
1	Negotiate with CRA reviewer	CRA & client	30 days
2	2nd admin. review	CRA & client	180 days
3	Objection	CRA & client	365 days
4	Tax Court of Canada		
	a) Appeal - Informal	CRA, Dept. of Justice client	6-9 months
	b) Appeal - General	CRA, Dept. of Justice client	2-3 years

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Dispute resolution - formal vs. informal appeal strategies

General Procedure (tax court)

- generally cost $40,000+
- require use of a lawyer (tax litigator)
- takes 3+ years during which
- subsequent SR&ED claims can be held up

Informal Procedure (tax court)

- $100 application fee
- client or accountant can represent
- no lawyer required
- takes < 1 year
- limited to $12,000 / year
- provides legal precedent for future years

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Tax Court of Canada – informal appeal levels to rise – related SR&ED strategies

Overview

Currently all judgments that allow appeals under the informal procedure are limited to

- Taxes payable of $12,000, or
- Taxable income of $24,000.

Those amounts, $12,000 and $24,000, are increased to $25,000 and $50,000, respectively.[9]

Timing of implementation

The amendments apply with respect to appeals for which

- a notice of appeal is filed with the Tax Court
- after the day on which Royal Assent is received.

Author's comment: high significance

As discussed in newsletter 2012-5 this "informal procedure" strategy has some of the following advantages:

General Procedure (tax court)

- generally cost $40,000+
- require use of a lawyer (tax litigator)
- take 3+ years during which
- subsequent SR&ED claims can be held up

Informal Procedure (tax court)

- $100 application fee
- client or accountant can represent
- no lawyer required
- takes < 1 year
- limited to $12,000 / year
- **provides legal precedent for future years**

As a result there are few incentives & huge barriers to prevent taxpayers from using the general procedure no matter how much their claim has merit.

Implications to claimants

In the author's opinion the CRA desperately needs an arbitration method to get disputed claims settled **quickly.**

Sadly the informal procedure seems to be the best current method to achieve any type of "justice."

Typical dispute resolution steps & timelines

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	a) Appeal - Informal	CRA, Dept. of Justice client	6-9 months
	b) Appeal - General	CRA, Dept. of Justice client	2-3 years

Notable quote:

"Innovation is the ability to convert ideas into invoices."

- L. Duncan

[9] Notice of Ways and Means Motion , Explanatory Notes Relating to the Income Tax Act & the Tax Court of Canada Act, April , 2013, clauses 24 & 25

SR&ED changes in March 29, 2012 Federal budget

	Year change proposed to start (prorate)	2012 current	2013	2014 full effect
1)	Federal ITC rate (non-CCPC)	20	20	15
2)	Subcontractor costs (% eligible)	100	80	80
3)	Rate to calculate proxy (overhead)	65	60	55
4)	Capital equipment (% eligible)	100	100	0

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Status of current SR&ED legislation

Source	SR&ED related issue	Effective date	Status
2013 Federal Budget	penalty of $1,000 for incomplete info about SR&ED tax preparation	1-Jan-14	Pending
2012 Federal Budget	Expenditure of a capital nature will no longer qualify for SR&ED tax incentives.	1-Jan-14	Now law
	Rate of overhead under the proxy method reduced from 65% to 55% over a two year period.	Expenditures after 2012	Now law
	Contract SR&ED & third-party payments will only be 80% eligible for ITCs.	Expenditures after 2012	Now law
	The basic 20% ITC for SR&ED qualified expenditures will be reduced to 15%.	Expenditures after 2012	Now law
Prior budgets	Stock option benefit denial of expenditure	17-Nov-05	Pending
	Removal of subsection 220(2.1) discretion	17-Nov-05	Pending

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Status of current SR&ED legislation

- Reviewing the length of time that it takes to pass legislation, the 2012 budget changes were:
  - - announced in March 29, 2012 &
  - - approved into law December 14, 2012 (Bill C-45)
- As a result we can hope that the proposed changes to the informal appeal to the Tax Court of Canada will be passed by the end of 2013.

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Status of current SR&ED legislation

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Prior budgets	Stock option benefit denial of expenditure	17-Nov-05	Pending
	Removal of subsection 220(2.1) discretion	17-Nov-05	Pending

Implications to SR&ED claimant's

The table above illustrates the status of various pronouncements as of March 31, 2013.

Technically SR&ED claimants are only required to follow these rules once they have received Royal assent and become law.

In the interim they are merely recommendations which the CRA will apply as if they were law.

This creates an interesting position for any of the "pending" legislation on this table.

Reviewing the length of time that it takes to pass some of this legislation, the 2012 budget changes were:

- announced in March 29, 2012 &
- approved into law December 14, 2012 (Bill C-45)

As a result we can hope that the proposed changes to the informal appeal to the Tax Court of Canada will be passed by the end of 2013.

Notable quote:

"There are no old roads to new directions."

- The Boston Consulting Group

Notable quote

"They always say time changes things, but you actually have to change them yourself."

- Andy Warhol

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III) New CRA pronouncements & procedures

- New form T661 (to reflect 2013 changes)]
- CRA Consolidated SR&ED policy documents (Dec 19, 2012)
- "Eligibility of work for SRED": Tax Act, Court & CRA definitions
- New CRA Request for information (RFI) procedures
  - [New focus on “weekly” timesheet details]
  - [Request for 5+ pages of sample technical documents]
- New CRA software example
- 10 New CRA DRAFT examples of project “issues”
- 2013 YMPE set at $51,100

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New form T661
(to reflect 2013 changes)

- In October 2013 the CRA will be releasing a revised Form T661 to
  - accommodate the legislative changes coming into effect on January 1, 2014 &
  - ensure consistent with consolidated SR&ED policy documents released December 2012.
- This revised version of Form T661 (13) (revision code 1301) will be effective as of its publication date. We encourage you to start using the new form as soon as it is available.
- You can submit the T661(12) version of the form until December 31, 2013.
- Starting January 1, 2014, we will accept only the T661(13) version of the form for all tax years.

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[CRA Consolidated SR&ED policy documents (Dec 19, 2012)]

On December 19, 2012 the CRA released a consolidated document to replace all prior SR&ED

- - Interpretation Bulletins (IT's)
- - Information Circulars (IC's) &
- - Application Policy Papers (APP's)

The CRA claims that this change:

- does not represent any new policies
- provides clarification on certain issues &
- removes ambiguities among former documents.

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“Eligibility of work for SRED": Tax Act, Court & CRA definitions

Perhaps the most significant “new” analysis within the Policy Papers is an attempt to correlate;

- The **CRA’s 3 component eligibility** criteria to
- *The **5 criteria** used by the **Tax Court of Canada***

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International definition of an R&D project

- "For a … project to be classified as R&D, its completion must be dependent on a scientific &/or **technological advance**, the aim of the project must be the **systematic resolution** of a scientific and/or **technological uncertainty**."

- Source: Frascati Manual 2002, paragraph 135

“Defining the SR&ED project” Tax Court vs. CRA Guidance

CRA SR&ED Guidance – the consolidated document

- Role of the TCC vs. expert witness
- Tax Court outlines the SR&ED process
- Defining the “Scientific method”
- SR&ED project eligibility – TCC vs. CRA requirements

Project template (simple view)

- Step 1a): Ensure proper definition of existing knowledge at the outset
- Step 1 b): Quantification of objectives vs. standard practice
- Step 2: Correlate experiments to hypotheses
- Step 3a): Ensuring work was done “systematically”
- Step 3b): Clarifying the “technological conclusions / advancements”

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CRA SR&ED Guidance – the consolidated document

December 19, 2012 the CRA released a consolidated document to replace all prior

- Interpretation Bulletins (IT's)
- Information Circulars (IC's) &
- Application Policy Papers (APP's)
- related to SR&ED credits.

While the CRA claims that it

- does not represent any new policies
- they do provide clarification on certain issues &
- remove ambiguities among former documents.

Perhaps the most significant "new" analysis is an attempt to correlate;

- The CRA's 3 component eligibility criteria to
- The 5 criteria used by the Tax Court of Canada / Scientific Method

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Notable quote

"There is nothing wrong with change, if it is in the right direction"

- Sir Winston Churchill

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CRA Eligible SR&ED project

"Set of interrelated activities that:

1. Attempt technological **advancement**
2. to overcome technological **uncertainty**,
3. pursued through **systematic investigation** by qualified individuals."

Note: "Technological Advancement" & "Systematic Investigation" are the only of these terms used in the Income Tax Act.

SR&ED definition – Income Tax Act

Canada - *Income Tax Act* defines SR&ED as

- **"systematic investigation** or search, that is
- carried out **in a field of science or technology,**
- **by** means of **experiment or analysis and** that is:"
  a) Basic Research
  b) Applied Research or
  c) Experimental Development *

* *"**Technological advancement"** for the purpose of **creating new, or improving existing**, **materials, devices, products or processes***

Tax Court – SR&ED requirements & 5 step process

Landmark SR&ED tax case of **Northwest Hydraulics - 5 questions:** basis for evaluating SR&ED projects:

1. Is there a **technical risk or uncertainty**?

2. Did the person claiming to be doing SRED formulate **hypotheses** specifically aimed at reducing or eliminating that **technological uncertainty**? This involves a five stage process:

   a. the observation of the **subject matter** of the problem;
   b. the formulation of a clear **objective**;
   c. the identification and articulation of the **technological uncertainty**;
   d. the formulation of an hypothesis or **hypotheses** designed to reduce or eliminate the uncertainty;
   e. the methodical and **systematic testing** of the hypotheses.

3. Did the procedures adopted accord with established and objective principles of **scientific method**, characterized by trained and systematic observation, measurement and experiment, and the formulation, testing and modification of hypotheses?

4. Did the process result in a **technological advance**, that is to say an advancement in the **general understanding**?

5. Although the Income Tax Act and the Regulations do not say so explicitly, it seems self-evident that a detailed **record of the hypotheses, tests and results be kept**, and that it be kept as the work progresses.

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TCC - Role of the “expert witness”

RIS Christie : role of the scientists in determining SR&ED eligibility

- “What constitutes scientific research for the purposes of the Act is either a **question of law** or a question of mixed law and fact to be **determined by the Tax Court of Canada**, not expert witnesses, as is too frequently assumed by counsel for both taxpayers and the Minister.

- An expert may assist the court in evaluating technical evidence and seek to persuade it that the research objective did or could not lead to a technological advancement. But, at the end of the day, the **expert’s role** is limited to providing the court with a set of **prescription glasses through which technical information can be viewed** before being analyzed and weighed by the trial judge.”

Tax Court provides additional "process" suggestions

Landmark SR&ED tax case of Northwest Hydraulics

- Judge's Question #2.
- "Did the person claiming to be doing SR&ED formulate hypotheses specifically aimed at reducing or eliminating that technological uncertainty?

  This involves a **five stage process**:

  - a. the observation of the subject matter of the problem;
  - b. the formulation of a clear objective;
  - c. the identification and articulation of the technological uncertainty;
  - d. the formulation of an hypothesis or hypotheses designed to reduce or eliminate the uncertainty;
  - e. the methodical and systematic testing of the hypotheses."

WHAT INFORMATION IS REQUIRED	HOW TO PROVIDE INFO.
Scientific Method **Oxford Dictionary**	**RDBASE SR&ED project -** **5 Steps**
1. Define a question	**Step 1b):** Objectives > Standard Practice
2. Gather information and resources (observe)	**Step 1a):** Define Standard Practice (SP)
3. Form an explanatory hypothesis	**Step 2:** Correlate research to Uncertainties
4. Perform an experiment and collect data,	**Step 3a):** Work done "systematically"
5. Analyze the data	
6. Interpret the data and draw conclusions that serve as a starting point for new hypothesis	**Step 3b):** Clarifying "technological conclusions"
7. Publish results	Recommended but not required for SR&ED projects
8. Retest (frequently done by other scientists).	
Note: The iterative cycle inherent in this step-by-step methodology goes from point 3 to 6 back to 3 again	Provided via steps 2 & 3

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WHAT INFORMATION IS REQUIRED		HOW TO PROVIDE INFO.	Author's Commentary: HOW to meet all requirements
Tax Court of Canada (TCC) **5 SR&ED eligibility Questions**	**CRA intepretation** **3 Criteria**	**RDBASE SR&ED project -** **5 Steps**	
1. Was there a scientific or a **technological uncertainty**—an uncertainty that could not be removed by **standard practice**?	**2.** Scientific or technological **uncertainty**	**Step 1a):** Define Standard Practice (SP) **Step 1b):** Objectives > Standard Practice & **Step 2:** Correlate research to uncertainties	The TCC question **contemplates the first 3 steps** of the RDBASE SR&ED project structure.
2. Did the effort involve formulating **hypotheses** specifically aimed at reducing or eliminating that **uncertainty**?	**3.** Scientific & technical **content**	**Step 2**: Correlate research to uncertainties	**Hypotheses** require **"variables"** for experimentation. These create the basis for the **"controlled experiments"** required by the tax court.
3. Was the adopted procedure consistent with the total discipline of the **scientific method**, including formulating, testing, and modifying the hypotheses?	**3.** Scientific & technical **content**	**Steps 1-5: Specifically 3a):** Work done "systematically"	The **"scientific method"** is an internationally accepted definition which the **Tax Court of Canada has adopted** despite **resistance** by the **CRA**. Arguably the **"scientific method"** contemplates **all 5 steps** of the RDBASE SR&ED project structure.
4. Did the process **result in** a scientific or a **technological advancement**?	**1**. Scientific or technological **advancement**	**Step 3b):** Clarifying "technological conclusions" = advancements	**"Technological advancement" is the "conclusion"** after **ALL 5 steps** to be performed. The **tax courts** (correctly) recognize this is a **"result"** but the **CRA** still requests this as the **first step** of the reporting process.
5. Was a **record of** the hypotheses tested and the **results** kept as the work progressed?	**3.** Scientific & technical **content**	**Step 2:** Correlate research to uncertainties **Step 3a):** Work done "systematically"	**Documentation of experimentation** is required by both the "scientific method" & the CRA's "content" criteria.

RDBASE.NET International SR&ED template

		Recommended documentation	GOAL: prove to Government (CRA, IRS, patent office)
I	**OBJECTIVE BEYOND STANDARD PRACTICE**		
i)	**State of Existing technology**	State benchmarking methods & sources	Limits of information available to someone "skilled in the art."
ii)	**Objective(s)**	Top 5 measureable "Objectives"	Quantifiable Objectives beyond known limits
II	**TECHNOLOGICAL UNCERTAINTIES**	Top 5 "Variables" for experimentation	Formulate "test matrix" to test hypotheses
III	**EXPERIMENTAL ACTIVITY**	Defined by tax year*	
i)	**Experimentation method**	Number of alternatives tested & how?	Justify sample sizes
ii)	**Results**	Correlate to "Objectives"	Provide basis for Conclusions
iii)	**Conclusions**	Correlate to "Variables"	"New knowledge" illustrates "Technological Advancement"

2013

Notable quote

"The uncreative mind can spot wrong answers but it takes a very creative mind to spot wrong questions."

- Anthony Jan

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Step 1a): Definition of existing knowledge at the outset

Northwest Hydraulics

- CRA position (all work SP)
  - "work described … refers to standard devices and processes, which are routinely used in similar design situations all over the world."
- Tax Court Position
  - "It was the innovative combination and alignment of [these] factors that makes this project unique."

Author's commentary:

The Northwest Case illustrates how CRA officials may deny claims on the basis the project

- appears to be "routine engineering"
- without providing support for their position but
- identification of "variables" for experimentation
- provide adequate evidence for the TCC

- US / IRS directives – perhaps CRA can adopt?
  - Patent safe harbour
  - Rebuttal presumption
    - IRS must demonstrate within common knowledge if denied

Step 1 b): Quantification of objectives vs. standard practice

- Sass Manufacturing
  - “Systematic investigation connotes the existence of controlled experiments and of highly accurate measurements and involves the testing of one's theories against empirical evidence.
- Northwest Hydraulics
  - "Most scientific research involves gradual, indeed infinitesimal, progress.”

Step 2: Correlate experiments to technological uncertainties (hypotheses)

- CW Agencies
  - "The word **hypothesis** in this context is normally considered to mean a provisional concept which is not inconsistent with known facts and serves as a starting point for further investigation by which it may be proved or disproved objectively."
- Maritime Ontario Freight Lines
  - "A **hypothesis** is a tentative assumption or explanation to an unknown problem and, as a rule, this requirement is met by the existence of a logical plan devised to observe and resolve the hypothetical problem."

Identifying “key variables” within “hypotheses”

- Northwest Hydraulics
  - “I do not think that conventional engineering would be adequate to deal with **the variables** and the uncertainties that were inherent in the major disruption and diversion of the flow of the river resulting from the construction”
  - Technological uncertainty is something that exists in the mind of the specialist such as the appellant, who identifies and articulates it and applies its methods to remove that uncertainty.”

Additional definitions of "scientific hypotheses"

- From Wikipedia, the free encyclopedia
  - For a hypothesis to be a scientific hypothesis, the scientific method requires that one can test it.
  - Scientists generally base scientific hypotheses on previous observations that cannot satisfactorily be explained with the available scientific theories.
  - Normally hypotheses have the form of a mathematical model.
  - A working hypothesis is a provisionally accepted hypothesis proposed for further research.

Author's commentary: Evidence hypotheses via "test matrix."

- This would require the researcher to:
  - Identify the key variables which he/she believes explain the performance
  - Benchmark variables vs. existing models to predict their interaction
  - Rank the variables in order of significance
  - Test the variables to further understand shortfall of the existing models

Step 3a): Ensuring work was done "systematically"

- Sass Manufacturing
  - Scientific research must mean the enterprise of explaining and predicting and the gaining knowledge of whatever the subject matter of the hypothesis is.
  - This surely would include repeatable experiments in which the steps, the various changes made and the results are carefully noted."

Step 3a): Ensuring work was done "systematically"

- Rainbow Pipeline
  - "What may appear routine and obvious after the event may not have been before the work was undertaken.
  - What distinguishes **routine activity** from the methods required by the definition of **SR&ED** …. is **not solely** the adherence to **systematic routines**, but the adoption of **the entire scientific method,** with a view to removing a technological **uncertainty** through the formulation and **testing of** innovative and **untested hypotheses**."

Step 3b): Clarifying "technological conclusions / advancements"

- Rainbow Pipeline
  - "The rejection after testing of an hypothesis is nonetheless an advance in that it eliminates one hitherto untested hypothesis.
  - Much scientific research involves doing just that. The fact that the initial objective is not achieved invalidates neither the hypothesis formed nor the methods used.
  - On the contrary it is possible that the very failure reinforces the measure of the technological uncertainty."

US / IRS directives – perhaps CRA can adopt?

Rebuttable presumption. If a taxpayer demonstrates with credible evidence that:

- research activities were undertaken to obtain the information …
- would exceed…the common knowledge of skilled professionals
- in the particular field of science or engineering
- activities …satisfy the requirements.

The Commissioner (IRS auditor) may overcome the presumption [if he/she] **demonstrates that**

- the information was within the common knowledge of skilled professionals or
- the research activities were not undertaken to obtain the information described.

CRA SR&ED Guidance – the consolidated document

On December 19, 2012 the CRA released a consolidated document to replace all prior

- Interpretation Bulletins (IT's)
- Information Circulars (IC's) &
- Application Policy Papers (APP's)

related to SR&ED credits.

While the CRA claims that this change does not represent any new policies they do provide clarification on certain issues and in some cases remove ambiguities among former documents.

Perhaps the most significant "new" analysis is an attempt to correlate;

- The **CRA's 3 component eligibility** criteria to

- The **5 criteria** used by the **Tax Court of Canada**

Income Tax Act definition of SR&ED

SR&ED is defined for income tax purposes[1], as follows:

"**scientific research and experimental development** means **systematic investigation** or search that is carried out **in a field of science or technology by** means of **experiment or analysis and** that is

(a) **basic research**,..

(b) **applied research**,.. **or**

(c) **experimental development**, namely, work undertaken **for the purpose of achieving technological advancement** for the purpose of creating new, or improving existing, materials, devices, products or processes, including incremental improvements thereto,…"

CRA definition of a "SR&ED project"

"To establish whether or not the work you claim is eligible, we have to examine eligibility **at the project level**. You must present your claim showing your work organized as SR&ED projects."

"**An SR&ED project consists of a set of interrelated activities** that meet the **three criteria** of SR&ED defined in the current version of Information Circular 86-4, Scientific Research and Experimental Development.

This means that the set of activities must be necessary for:

1. the attempt to achieve specific scientific or **Technological Advancement**

2. overcome scientific or **technological uncertainty,** and

3. must be pursued through a **systematic investigation** by means of experiment or analysis performed **by qualified individuals**."[2]

Notable quote:

"The impossible is often the untried."

- J. Goodwin

[1] in subsection 248(1) of the Act

[2] Excerpts from CRA form T4088[2]- the Guide to completing an SR&ED claim

Tax Court of Canada (TCC) – outlines SR&ED process

In the landmark SR&ED tax case of Northwest Hydraulics the judge stated 5 questions which have become the basis for evaluating SR&ED projects:

1. Is there a technical risk or **uncertainty**?

2. Did the person claiming to be doing SRED formulate **hypotheses** specifically aimed at reducing or eliminating that technological uncertainty? This involves a **five stage process:**

   a. the observation of the subject matter of the problem;
   b. the formulation of a clear objective;
   c. the identification and articulation of the technological uncertainty;
   d. the formulation of an hypothesis or hypotheses designed to reduce or eliminate the uncertainty;
   e. the methodical and systematic testing of the hypotheses.

3. Did the procedures adopted accord with established and objective **principles of scientific method,** characterized by trained and systematic observation, measurement and experiment, and the formulation, testing and modification of hypotheses?

4. Did the process result in a **technological advance**, that is to say an advancement in the general understanding?

5. Although the Income Tax Act and the Regulations do not say so explicitly, it seems self-evident that a **detailed record** of the hypotheses, tests and results be kept, and that it be kept as the work progresses

The CRA has addressed these questions and attempted to

- correlate them with their own 3 step format
- as illustrated on page 4.

Role of the "expert witness"

As a background to his decision, the Federal court judge in the case of RIS Christie[3] provided an overview of the **role of the scientists** in determining SR&ED eligibility stating,

> "What constitutes scientific research for the purposes of the Act is either a **question of law** or a question of mixed law **and fact to be determined by the Tax Court of Canada, not expert witnesses**, as is too frequently assumed by counsel for both taxpayers and the Minister.
>
> An expert may assist the court in evaluating technical evidence and seek to persuade it that the research objective did or could not lead to a technological advancement. But, at the end of the day, the **expert's role is limited to providing the court with a set of prescription glasses through which technical information can be viewed** before being analyzed and weighed by the trial judge."

Notable quote:

"The only way to discover the limits of the possible is to go beyond them into the impossible."

- A.C. Clarke

[3] RIS Christie v. The Queen [1996] E.T.C. 537 (TCC), [1999] E.T.C. 2004 (FCC)

Project template (simple view)

RDBASE.NET International SR&ED template

			Recommended documentation	GOAL: prove to Government (CRA, IRS, patent office)
I		**OBJECTIVE BEYOND STANDARD PRACTICE**		
	i)	**State of Existing technology**	State benchmarking methods & sources	Limits of information available to someone "skilled in the art."
	ii)	**Objective(s)**	Top 5 measureable "Objectives"	Quantifiable Objectives beyond known limits
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III		**EXPERIMENTAL ACTIVITY**	Defined by tax year*	
	i)	**Experimentation method**	Number of alternatives tested & how?	Justify sample sizes
	ii)	**Results**	Correlate to "Objectives"	Provide basis for Conclusions
	iii)	**Conclusions**	Correlate to "Variables"	"New knowledge" illustrates "Technological Advancement"

Defining the "Scientific method"

The classical definition in the Oxford English Dictionary states;

"The scientific method is a method of procedure that has characterized natural science since the 17th century, consisting in

- **systematic observation,**
- **measurement,**
- **experiment, and the**
- **formulation, testing, and modification of hypotheses.**"

A linearized, pragmatic scheme **list is offered below**."

A modern update from Wikipedia

"Scientific method refers to a;

- body of **techniques**
- for investigating phenomena,
- **acquiring new** knowledge, or
- **correcting** & integrating **previous knowledge**.

To be termed **scientific**, a method of inquiry must be based on

- gathering empirical and **measurable evidence**
- subject to specific principles of reasoning.

WHAT INFORMATION IS REQUIRED	HOW TO PROVIDE INFO.
Scientific Method **Oxford Dictionary**	**RDBASE SR&ED project -** **5 Steps**
1. Define a question	**Step 1b):** Objectives > Standard Practice
2. Gather information and resources (observe)	**Step 1a):** Define Standard Practice (SP)
3. Form an explanatory hypothesis	**Step 2:** Correlate research to Uncertainties
4. Perform an experiment and collect data,	**Step 3a):** Work done "systematically"
5. Analyze the data	
6. Interpret the data and draw conclusions that serve as a starting point for new hypothesis	**Step 3b):** Clarifying "technological conclusions"
7. Publish results	Recommended but not required for SR&ED projects
8. Retest (frequently done by other scientists).	
Note: The iterative cycle inherent in this step-by-step methodology goes from point 3 to 6 back to 3 again	Provided via steps 2 & 3

The **table above** highlights how

- the RDBASE project structure
- correlates directly with the Scientific Method.

The **chart on the next page** then compares the SR&ED questions posed by each of:

- the Tax Court of Canada (TCC)
- Canada Revenue Agency (CRA) &
- The Scientific Method (RDBASE reporting structure)

SR&ED project eligibility – TCC vs. CRA requirements

WHAT INFORMATION IS REQUIRED		HOW TO PROVIDE INFO.	Author's Commentary: HOW to meet all requirements
Tax Court of Canada (TCC) **5 SR&ED eligibility Questions**	**CRA intepretation** **3 Criteria**	**RDBASE SR&ED project -** **5 Steps**	
1. Was there a scientific or a **technological uncertainty**—an uncertainty that could not be removed by **standard practice**?	**2.** Scientific or technological **uncertainty**	**Step 1a):** Define Standard Practice (SP) **Step 1b):** Objectives > Standard Practice & **Step 2:** Correlate research to uncertainties	The TCC question **contemplates the first 3 steps** of the RDBASE SR&ED project structure.
2. Did the effort involve formulating **hypotheses** specifically aimed at reducing or eliminating that **uncertainty**?	**3.** Scientific & technical **content**	**Step 2**: Correlate research to uncertainties	**Hypotheses** require **"variables"** for experimentation. These create the basis for the **"controlled experiments"** required by the tax court.
3. Was the adopted procedure consistent with the total discipline of the **scientific method**, including formulating, testing, and modifying the hypotheses?	**3.** Scientific & technical **content**	**Steps 1-5: Specifically 3a):** Work done "systematically"	The **"scientific method"** is an internationally accepted definition which the **Tax Court of Canada has adopted** despite **resistance** by the **CRA**. Arguably the **"scientific method"** contemplates **all 5 steps** of the RDBASE SR&ED project structure.
4. Did the process **result in** a scientific or a **technological advancement**?	**1**. Scientific or technological **advancement**	**Step 3b):** Clarifying "technological conclusions" = advancements	**"Technological advancement" is the "conclusion"** after **ALL 5 steps** to be performed. The **tax courts** (correctly) recognize this is a "**result**" but the **CRA** still requests this as the **first step** of the reporting process.
5. Was a **record of** the hypotheses tested and the **results** kept as the work progressed?	**3.** Scientific & technical **content**	**Step 2:** Correlate research to uncertainties **Step 3a):** Work done "systematically"	**Documentation of experimentation** is required by both the "scientific method" & the CRA's "content" criteria.

Step 1a): Ensure proper definition of existing knowledge at the outset:

Northwest Hydraulics[4]

CRA position (all work SP)

> "Standard Practice refers to directly adapting a known engineering or technological practice to a new situation when there is a high degree of certainty that the known technology or practice will achieve the desired objective.
>
> The devices and processes developed by NHC in the course of the modelling work may have been "new" in the sense of a new location (i.e. a hydraulic structure that was not there before, or the implementation of a river improvement scheme),
>
> but all of the work described in the NHC project reports refers to **standard devices and processes**, which are routinely used in similar design situations all over the world."

Judge's analysis

> "Q. Could these designs have been implemented by resorting merely to textbooks?
>
> A. No, you wouldn't find any of that in a textbook. But there are design guides available and certainly there are **suggestions** there and these were used in the **initial design**. But not enough is available there to, I think, develop an effective design of this type.
>
> It is true that any one of the features of the final design may have been known - rubber weirs, radial gates and walls of different types were known. It was the innovative **combination and alignment** of these factors that makes this project unique."

Judge's ruling & rationale

> "The CRA's position, was essentially that the appellant, admittedly a **world leader** in the field of hydraulic model testing, **by its own excellence** sets the standard for what represents routine engineering or standard practice.
>
> With respect I think that this **sets an unrealistically high standard** - indeed a standard of perfection that would discourage scientific research in Canada.

Author's commentary:

The Northwest Case illustrates how CRA officials may deny claims on the basis the project

- appears to be "routine engineering"
- without providing support for their position but
- identification of "variables" for experimentation
- provide adequate evidence for the TCC

US / IRS directives – perhaps CRA can adopt?

In the United States the IRS[5] provides additional directives for determining "standard practice" within SR&ED claims.

> **Means of discovery**. In seeking to obtain knowledge that exceeds, expands, or refines the common knowledge of skilled professionals in a particular field of science or engineering, a taxpayer may employ existing technologies in a particular field and may rely on existing principles of science or engineering.
>
> **Patent safe harbor.** The issuance of a patent by the Patent and Trademark Office… is **conclusive evidence** that a taxpayer has obtained knowledge that exceeds, expands, or refines the common knowledge of skilled professionals. However, the issuance of such a patent is **not a precondition** for credit availability.
>
> **Rebuttable presumption**. If a taxpayer demonstrates with credible evidence that:
>
> - research activities were undertaken to obtain the information …
> - would exceed…the common knowledge
> - of skilled professionals in the particular field of science or engineering
> - activities …satisfy the requirements.
>
> The **Commissioner (IRS auditor) may overcome the presumption** [if he/she] **demonstrates** that
>
> - the information was within the **common knowledge** of skilled professionals **or**
> - the research **activities** were **not** undertaken **to obtain** the information described.

[4] Northwest Hydraulic Consultants Ltd., v The Queen, (Date: 1998/05/01 – TCC, Docket: 97-531(IT))

[5] Internal Revenue Service 26 CFR Parts 1 and 602 [TD 8930] RINs 1545-AV14 and 1545-A051

Step 1 b): Quantification of objectives vs. standard practice

Tax Court of Canada statements:

Sass Manufacturing[6]

> "Systematic investigation connotes the **existence of controlled experiments and of highly accurate measurements** and involves the **testing of one's theories against empirical evidence**.

Northwest Hydraulics[7]

> "The addition of these words ["including **incremental improvements** thereto"] in 1995 applicable to taxation years ending after December 2, 1992 appears to have been in response to a concern that the achievement or attempted achievement of slight improvements was not covered.
>
> I should not have thought it was necessary to say so. Most scientific research involves **gradual, indeed infinitesimal, progress**. Spectacular breakthroughs are rare and make up a very small part of the results of SR&ED in Canada."

Notable quote:

"If GM had kept up with technology like the computer industry has, we would all be driving $25 cars that got 1000 MPG."

- Bill Gates

[6] Sass Manufacturing Limited v. M.N.R., 88 DTC 1363
[7] Northwest Hydraulic Consultants Ltd., v The Queen, (Date: 1998/05/01 – TCC, Docket: 97-531(IT))

Step 2: Correlate experiments to technological uncertainties (hypotheses):

Tax court definitions of "hypotheses"

Tax Court of Canada judges have made the following statements:

CW Agencies[8] **:**

> "The word **hypothesis** in this context is normally considered to mean a **provisional concept** which is not inconsistent with known facts and **serves as a starting point for further investigation by which it may be proved or disproved objectively**."

Maritime Ontario Freight Lines[9] ,

> "**A hypothesis** is a tentative assumption or explanation to an unknown problem and, as a rule, this **requirement is me**t by the existence of a **logical plan** devised to observe and resolve the hypothetical problem."

Northwest Hydraulics

> "I do not think that **conventional engineering** would be adequate to deal with the **variables** and the uncertainties that were inherent in the major disruption and diversion of the flow of the river resulting from the construction"[10]
>
> The technological uncertainty is something that exists in the mind of the specialist such as the appellant, who identifies and articulates it and applies its methods to remove that uncertainty."[11]

[8] CW Agencies vs. MNR, Date: 2000/08/30, Docket: 98-1324(IT)G, (TCC)
[9] Maritime-Ontario Freight Lines Limited and Her Majesty the Queen (CITATION:2003 TCC 674) – informal procedure
[10] Ibid NW Hydraulics, Paragraph 22
[11] Ibid NW Hydraulics, Paragraph 82

Additional definitions of "scientific hypotheses"

Webster's online dictionary

Hypothesis, n.; pl. Hypotheses:

1. A **supposition**; a proposition or principle which is supposed or taken for granted, in order to draw a conclusion or inference for proof of the point in question;

2. **(Natural Science)** A **tentative theory** or supposition provisionally adopted to explain certain facts, and **to guide** in the **investigation** of others; hence, frequently called a working hypothesis.

From Wikipedia, the free encyclopedia

Hypothesis:

The term comes from the Greek, hypotithenai meaning "to put under" or "to suppose".

A hypothesis (plural hypotheses) is a proposed explanation for a phenomenon.

For a hypothesis to be a **scientific hypothesis, the scientific method** requires that one can test it.

Scientists generally **base** scientific hypotheses on **previous observations** that cannot satisfactorily be explained with the available scientific theories.

Hypothesis development

Normally hypotheses have the form of a **mathematical model.**

A **working hypothesis** is a provisionally accepted hypothesis proposed for further research.

Author's commentary:

Evidence of hypotheses is the development of a "test matrix."

This would require the researcher to:

- Identify the **key variables** which he/she believes explain the performance
- **Benchmark** variables vs. existing models to predict their interaction
- **Rank** the variables in order of significance
- **Test** the variables to further understand shortfall of the existing models

If the **variables of a "test matrix"**

- can be identified this provides **objective evidence** of the technological advancement
- conversely, if they can't be identified it will be nearly impossible to illustrate the limits of standard practice models.

Notable quote:

"Life is trying things to see if they work."

- Ray Bradbury

Step 3a): Ensuring work was done "systematically"

Tax Court of Canada statements:

Sass Manufacturing[12]

> "Systematic investigation connotes the **existence of controlled experiments and of highly accurate measurements** and involves the **testing of one's theories against empirical evidence**.
>
> Scientific research must mean the **enterprise of explaining and predicting** and the gaining knowledge of whatever the subject matter of the hypothesis is.
>
> This surely **would include repeatable experiments in** which the steps, the various changes made and the **results are carefully noted**."

Zeuter Developments[13]

> "As stated in RIS-Christie, the only reliable method of **demonstrating** that scientific research was undertaken in a **systematic fashion** is to produce **documentary evidence**."

Rainbow Pipeline[14]

> "What may appear routine and obvious after the event may not have been before the work was undertaken.
>
> **What distinguishes routine activity from** the methods required by the definition of **SRED** …. is not solely the adherence to systematic routines, but the **adoption** of the **entire scientific method,** with a view to removing a technological uncertainty through the formulation and testing of innovative and untested hypotheses."

Step 3b): Clarifying the "technological conclusions / advancements"

Tax Court of Canada statements:

Rainbow Pipeline[15]

> "Did the process result in a technological advance, that is to say an advancement in the general understanding?"
>
> On this issue he commented,
>
> "The **rejection after testing of an hypothesis is nonetheless an advance** in that it eliminates one hitherto untested hypothesis.
>
> Much scientific research involves doing just that. **The fact that the initial objective is not achieved invalidates neither the hypothesis formed nor the methods used**. On the contrary it is possible that the very failure reinforces the measure of the technological uncertainty."

Notable quote:

"An idea that is not dangerous is unworthy of being called an idea at all."

- Oscar Wilde

[12] Sass Manufacturing Limited v. M.N.R., 88 DTC 1363
[13] Zeuter Development Corporation v. The Queen, 2006 TCC 549, 2007 DTC 41, para 28
[14] Rainbow Pipeline Company Ltd., Date: 1999/09/15, Docket: 96-4369-IT-G I, (TCC)
[15] Rainbow Pipeline Company Ltd., Date: 1999/09/15, Docket: 96-4369-IT-G I, (TCC)

Notable quote

"He who asks a question is a fool for 5 minutes. He who does not ask a question remains a fool forever."

- Chinese proverb

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[New CRA Request for information (RFI) procedures]

- Since approximately January 2013 the CRA has been sending “requests for information” (RFI’s) to a large % of claimants.

- These RFI’s tend to include questions which can be divided into 3 categories:
  - Standard questions asked nationally of all claimants
  - Questions specific to a district office &
  - Questions specific to an individual reviewer

 Practitioner Workshop Sept 25, 2013

New CRA Request for information (RFI) procedures

[Request for 5+ pages of sample technical documents]

- Please send this information up to maximum of five (5) letter-sized (8.5" x 11") pages for each project claimed which **you feel best demonstrates** that the work meets the definition of SR&ED in Subsection 248(1) of the Income Tax Act.

- In addition, if not included in the above sample, please send us copies of the contemporaneous evidence that:
  - • recorded your initial **due diligence** activities and that shows that available technology could not overcome the technological problem or obstacle that you faced;
  - • recorded **the plan** you subsequently devised to overcome the technological problem or obstacle;
  - •**Preserved** the new technological **knowledge gained** by the company.

[New CRA Request for information (RFI) procedures]

[New focus on "weekly" timesheet details]

- SR&ED Wages & Contractor labour

  For salaries, wages and contract labour, please provide:

  - An organization chart with job descriptions/duties for each person claimed.
  - Details of activities for each SR&ED Project claimed, including
  - number of hours claimed for each individual per activity, per month.

  Contractors

  - For each contractor, we require a copy of the contract(s) & statement(s) of work.

Recommended timesheet details to address RFI procedures

Project details	
#	Name

FISCAL YEAR ENDED:	

Employee Man-Hours & Cost Summary

Employee details			Linking work to SR&ED				SR&ED wages	
First Name	Last Name	Hours Worked	Type of work Drop down	Variables of research (If possible link work to "Variables" of uncertainty)	Comments	location of work	hourly $ rate	SR&ED $
			1) Design 2) Testing 3) Programming 4) Supervision	*OPTIONAL - Link to the variables in the project*	*OPTIONAL - should be completed by the more senior people if possible.*			
NEED TOTALS BY STATE / PROVINCE								$ _____ -

New CRA pronouncements & procedures

Request for information (RFI) procedures

Since approximately January 2013 the CRA has been sending "requests for information" (RFI's) to a large % of claimants.

These RFI's tend to include questions which can be divided into 3 categories:

- Standard questions asked nationally of all claimants
- Questions specific to a district office &
- Questions specific to an individual reviewer

Technical documentation

On your T661 Part 2, you indicated availability of contemporaneous information as captured in the table below.

Line Description	Project Number(s)
270 Project planning documents	1
271 Records of resources .. . , time sheets	1,2 & 3
272 Design of experiments	1,2 & 3
273 Project records, laboratory notebooks	1,2 & 3
274 Desiqn, system architecture ... code	
275 Records of trial runs	2 & 3
276 Progress reports, minutes ... meetings	
277 Test protocols, test data ... conclusions	1 & 3
278 Photographs and videos	
279 Samples, prototypes ... other artefacts	
280 Contracts	1,2 & 3
281 Others:	

Please send this information up to maximum of **five (5) letter-sized (8.5" x 11") pages for each project** claimed which you feel best demonstrates that the work meets the definition of SR&ED in Subsection 248(1) of the Income Tax Act.

In addition, if not included in the above sample, please send us copies of the **contemporaneous evidence** that:

• recorded your initial **due diligence** activities and that shows that available technology could not overcome the technological problem or obstacle that you faced;

• recorded **the plan** you subsequently devised to overcome the technological problem or obstacle;
•Preserved the **new technological knowledge** gained by the company.

SR&ED Wages & Contractor labour

For salaries, wages and contract labour, please provide:

• An organization chart with job descriptions/duties for each person claimed.
• **Details of activities** for each SR&ED Project claimed, including
• number of hours claimed **for each individual per activity, per month**.

Contractors

For each contractor, we require a copy of the contract(s) & statement(s) of work.

Author's comment (high significance)

New focus on "weekly" timesheet details

Perhaps the most notable item in the RFI questionnaires is consistent request for **timesheet** detail at a monthly**, weekly** or in some cases even a daily level.

These requests seem to be focused on small and large claimants alike.

Since current CRA directions on how to prepare proper timesheet are vague as to what is actually required this is likely to become an issue of contention.

Ultimately each employee should be able to identify how his or her

- "design or testing" work was
- "necessary to resolve"
- one or more of the stated "uncertainties."

Having the development team agree on the key variables of experimentation allows this correlation to take place.

Sample CRA "Request For Information" (RFI) template (2 pages)

Canada Revenue Agency | Agence du revenu du Canada

[redacted]

[redacted]

Re: Scientific Research and Experimental Development (SR & ED) Claim

[redacted]

Request for Information (RFI)

Thank you for submitting your claim for the above fiscal period. We have examined the information you submitted and found that the work you described does not appear to meet the definition of SR&ED in section 248(1) of the Income Tax Act. Consequently, as part of the administration of the Scientific Research and Experimental Development (SR&ED) Program by the Canada Revenue Agency (CRA), we require the following technical and financial information in order to determine whether your SR&ED claim requires a detailed review:

Technical Information:

1) People and contractors who did the work

- A list of all people and contractors claimed with, for each, their
  - job title,
  - duties,
  - expertise/credentials, and
  - activities in the claimed project(s).
- An organization chart for the people claimed.

2) Activities claimed

- Details of activities for each SR&ED project claimed, including number of hours claimed for each individual person or contractor per activity, per month.

3) On Form T661 *Scientific Research and Experimental Development (SR&ED) Expenditures Claim*, you indicated that the evidence is available to support your claim(s). Please send us for each claimed project:

- a sample of your contemporaneous evidence that you feel best demonstrates that the work meets the definition of SR&ED in Subsection 248(1) of the Income Tax Act **up to a maximum of five (5)** letter-sized (8.5" x 11") pages for each project claimed.

In addition, if not included in the above sample, please send us copies of the contemporaneous evidence that:

- recorded your initial due diligence activities and that shows that available technology could not overcome the technological problem or obstacle that you faced;
- recorded the plan you subsequently devised to overcome the technological problem or obstacle;

- preserved the new technological knowledge gained by the company that was generated or created during the systematic search or investigation to create technological advancement.

Do not send original documents, bulk printouts of time records or source code, optical media or other mass storage devices (CDs, DVDs, flash memory) or physical samples, as we are unable to store these items. At CRA's option, these items may be returned to you without review of their contents. Send copies of documents and keep all originals handy in the event your SR&ED claim is subsequently selected for a detailed review.

Financial Information:

4) Form T661 and allowable SR&ED expenditures
   - Reconciliation of expenditures claimed on Form T661 to the adjustment made on line 118 of Schedule T2SCH1: *Net Income (Loss) for Income Tax Purposes* and the financial statements.

5) Revenues
   - Details regarding the source of your revenue(s), including sales invoices and contracts

6) Salary or wages directly engaged in SR&ED
   - Working paper(s) showing salaries claimed for each SR&ED project reconciled to the amount claimed on FormT661. Identify any bonuses, taxable benefits, severance payments or related benefits such as the employer's share of Canada Pension Plan, Employment Insurance, and Worker's Compensation Board payments that were included
   - Time records in support of the time spent by the employee in SR&ED and non-SR&ED activities. Time records may include employee time sheets, workbooks, diaries, meeting notes, etc. In the absence of time records, please explain the methodology used for the allocation of SR&ED and non-SR&ED activities
   - Payroll records to support employee wages expensed in the year including T4 information slips.
   - Details of wages payable and proof of payment for any portion of the claimed wages paid within 180 days after the fiscal year end.

7) Cost of materials consumed and/or transformed in performing SR&ED.
   - Itemized list with associated costs of the specific material items consumed and/or transformed for each SR&ED project that reconciles to the Form T661 amount claimed. Identify any payables at year-end.
   - Receipts supporting the claimed materials; and
   - Cancelled cheques supporting payment of the claimed materials.

You may send the information in paper-copy format by mail/courier to [redacted] in an envelope marked 'Private and Confidential'. Please note that CRA does not consider fax or email to be secure forms of electronic transmission.

Please provide the requested information on or before [redacted] If you do not submit the requested information by this date, CRA will process your claim on the basis of information on hand; this may result in disallowance of your SR&ED claim.

Please note, only a sample of information is currently being requested. If your claim is subsequently selected for a Detailed Technical and/or Financial Review, the CRA may contact you again to request more information and/or to set a time and place for a meeting to discuss your claim and review your contemporaneous information.

2013 YMPE set at $51,100

	SR&ED wages - annual limits					
					Specified	Non-specified
1	SR&ED labour:		YMPE		employees*	
	2011	$	48,300	$	241,500	No limit
	2012	$	50,100	$	250,500	No limit
	2013	$	51,100	$	255,500	No limit
2	Salary base for proxy amount					
	2011	$	48,300	$	120,750	No limit
	2012	$	50,100	$	125,250	No limit
	2013	$	51,100	$	127,750	No limit

***Specified employees own >=10% any class of stock (or related to such shareholders).**

SR&ED Salary & Wage inclusions

		Specified employees*	Non-specified employee	ITA section
1	**R&D labour for the:**			
	a) R&D expenditure pool (for deduction), **&**			37(1)
	b) Qualified expenses (for ITC calculation)			127(9)
	Type of expense:			
	· salary & wages	**In**	**In**	(5-8)
	· bonuses or profit based remuneration	**Out**	**In**	37(9) & 5(1)
	· Expenses paid > 180 days	**Out**	**Out**	78(4)
	Maximum	**5 x [YMPE]**	**N/A**	37(9.1)
2	**Salary base for proxy amount (for ITC calculation)**			
	Type of expense:			
	· Income from employment	**In**	**In**	5
	· bonuses/profit based remuneration	**Out**	**Out**	5(1) & 37(9)
		Out	**Out**	6 & 7
	· Expenses paid > 180 days	**Out**	**Out**	78(4)
	Maximum	**2.5x [YMPE]**	**N/A**	Reg. 2900(7)

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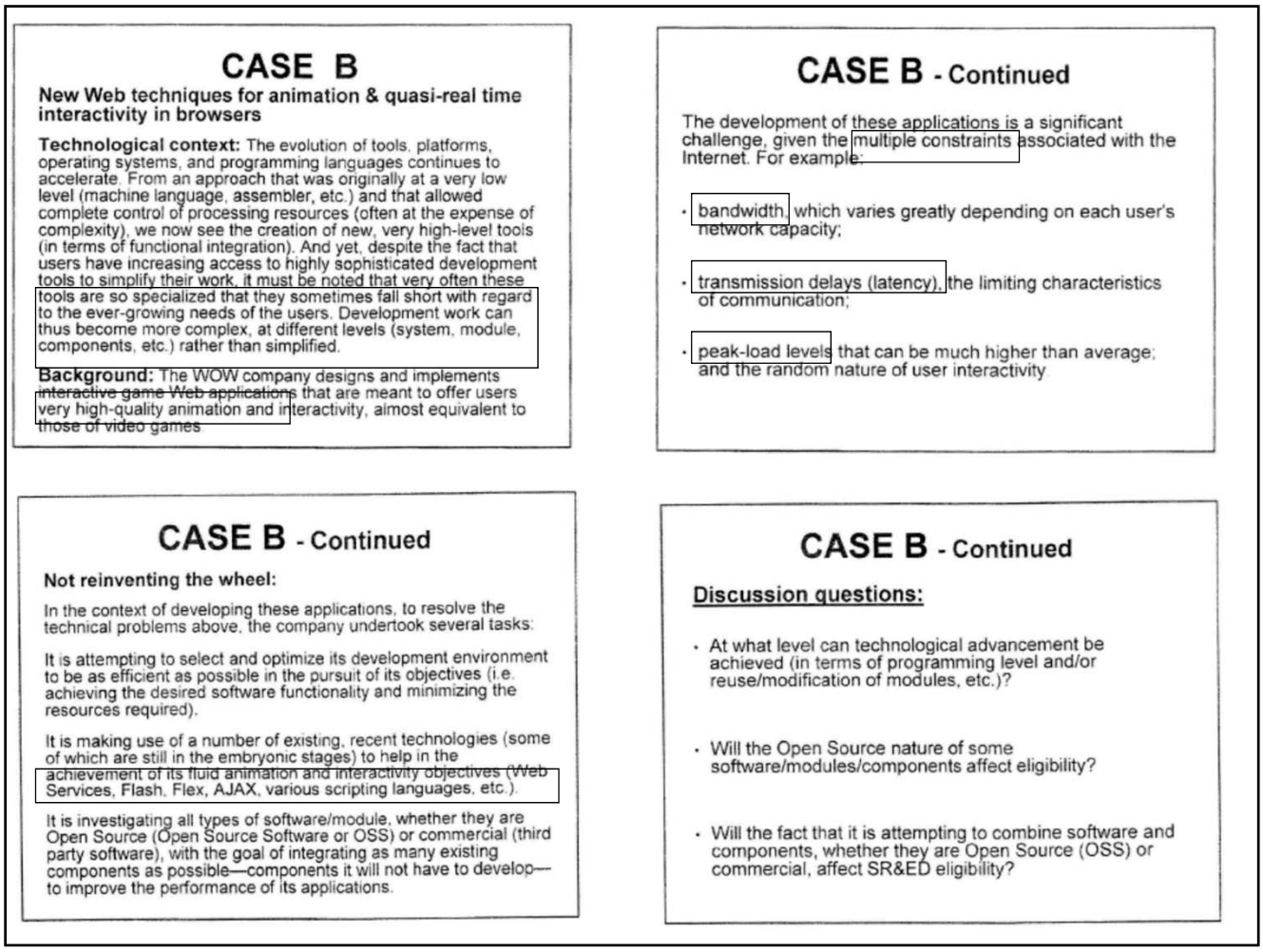
III) New CRA project examples

- New CRA software example
  - informal presentation

- 10 New CRA DRAFT examples of project “issues”
  - released Sept. 18, 2013
  - comments by Nov 18, 2013

 Practitioner Workshop Sept 25, 2013



CASE B

New Web techniques for animation & quasi-real time interactivity in browsers

Technological context: The evolution of tools, platforms, operating systems, and programming languages continues to accelerate. From an approach that was originally at a very low level (machine language, assembler, etc.) and that allowed complete control of processing resources (often at the expense of complexity), we now see the creation of new, very high-level tools (in terms of functional integration). And yet, despite the fact that users have increasing access to highly sophisticated development tools to simplify their work, it must be noted that very often these tools are so specialized that they sometimes fall short with regard to the ever-growing needs of the users. Development work can thus become more complex, at different levels (system, module, components, etc.) rather than simplified.

Background: The WOW company designs and implements interactive game Web applications that are meant to offer users very high-quality animation and interactivity, almost equivalent to those of video games.

CASE B - Continued

The development of these applications is a significant challenge, given the multiple constraints associated with the Internet. For example:

- bandwidth, which varies greatly depending on each user's network capacity;
- transmission delays (latency), the limiting characteristics of communication;
- peak-load levels that can be much higher than average; and the random nature of user interactivity

CASE B - Continued

Not reinventing the wheel:

In the context of developing these applications, to resolve the technical problems above, the company undertook several tasks:

It is attempting to select and optimize its development environment to be as efficient as possible in the pursuit of its objectives (i.e. achieving the desired software functionality and minimizing the resources required).

It is making use of a number of existing, recent technologies (some of which are still in the embryonic stages) to help in the achievement of its fluid animation and interactivity objectives (Web Services, Flash, Flex, AJAX, various scripting languages, etc.).

It is investigating all types of software/module, whether they are Open Source (Open Source Software or OSS) or commercial (third party software), with the goal of integrating as many existing components as possible—components it will not have to develop—to improve the performance of its applications.

CASE B - Continued

Discussion questions:

- At what level can technological advancement be achieved (in terms of programming level and/or reuse/modification of modules, etc.)?
- Will the Open Source nature of some software/modules/components affect eligibility?
- Will the fact that it is attempting to combine software and components, whether they are Open Source (OSS) or commercial, affect SR&ED eligibility?

Key Criteria Summary

R&D Base demo

1202 - Software - New Web techniques for animation & quasi-real time interactivity in browsers

Benchmarks: Internet searches: 16 sites / articles
Competitive products or processes: 14 products
Similar prior in-house technologies: 3 products /
Potential components: 2 products
Queries to experts: 2 responses

Objectives: Average Response time: 0.3 seconds
Data structures - number/complexity:
Average memory use: 5000 bytes / query
Maximum number of concurrent users: 25000 users
CPU usage: 30 % busy
Stability (mean time between failures): 100000 # transactions

Uncertainty: 1 - Technology constraints & related variables of experimentation

Key Variables: locking methods - spinlock, muteses, conditions, scheduling - queue sizes, levels, priorities, threads vs. processes-kernel vs.user level binding, User memory-virtual, mapped files, heaps, threads, Web services vs. Remoting / Flash- Flex vs. AJAX

Activity	Testing Methods	Results - % of Objective	Variables Concluded	Hours	Materials $	Subcontractor $	Fiscal Year
1 - Web services vs. Remoting / Flash- Flex vs. AJAX	Process trials: 120 runs / samples	Average Response time: 1.8 seconds (11 %) Maximum number of concurrent users: 1500 users (2 %) Average memory use: 14000 bytes / query (10 %)	Web services vs. Remoting / Flash- Flex vs. AJAX	300.00	0.00	0.00	2012
2 - Prototype testing - latency issues MS Windows	Process trials: 300 runs / samples	Average Response time: 0.6 seconds (82 %) Average memory use: 4000 bytes / query (110 %) Maximum number of concurrent users: 18000 users (70 %)	scheduling - queue sizes, levels, priorities	200.00	0.00	0.00	2012
3 - threads vs. processes-kernel vs.user level binding	Analysis / simulation: 100 alternatives	Maximum number of concurrent users: 13000 users (50 %) Average memory use: 8000 bytes / query (70 %) Average Response time: 0.7 seconds (76 %)	threads vs. processes-kernel vs.user level binding	250.00	0.00	0.00	2012
4 - scheduling - queue sizes, levels, priorities	Analysis / simulation: 1000 alternatives	CPU usage: 45 % busy (62 %)	scheduling - queue sizes, levels, priorities	100.00	0.00	0.00	2012
5 - locking methods - spinlock, muteses, conditions	Process trials: 450 runs / samples	Stability (mean time between failures): 75000 # transactions (71 %) Average Response time: 0.4 seconds (94 %)	locking methods - spinlock, muteses, conditions	120.00	0.00	0.00	2012
6 - User memory-virtual, mapped files, heaps, threads	Physical prototypes: 6 samples ... prototype revisions: 600 revisions	Average Response time: 0.25 seconds (102 %) Average memory use: 7000 bytes / query (80 %) Maximum number of concurrent users: 22000 users (87 %) CPU usage: 34 % busy (90 %)	User memory-virtual, mapped files, heaps, threads	160.00	0.00	0.00	2012

New CRA software example – what is NOT SR&ED

On November 1, 2012 the CRA hosted a working session during which they presented the following project example to stakeholders.

Sadly, the CRA then claimed that this was NOT intended to be an example of eligible work!

Author's commentary:

Having spoken to over 20 participants at this meeting the author proposes the following questions:

1) Why did the CRA waste half a day of time for nearly 80 participants to illustrate what is NOT SR&ED?

2) Does the CRA have ANYONE BOTH WILLING & CAPABLE of developing an example of a potentially eligible project?

The CRA Directorate (Ottawa) has been promising to provide improved SR&ED descriptions for over 1 year but nothing has been released.

Without such direction the entire system is experiencing tremendous inefficiencies.

As a result software RTA's are beginning to claim they "can't see the technological advancement" in ANY software development.

This situation is expected to worsen due to the fact that the RTA's:

- Have NO examples (or ideas) of
- relevant evidence of technological advancement.

Recommendations:

We desperately need to have **someone within the CRA** leadership:

a) with both the skills & direction to **create at least 1 eligible project example &/or**

b) the wisdom **to allow industry & practitioners to do so.**

Description – revised for potential eligibility

Since there currently appears to be NO intention or ability of the CRA to develop such examples we have chosen to:

- Add details & issues of similar software projects which,

- MIGHT be eligible as SR&ED including,

- the rational for this eligibility.

While this project itself is not typical of a strong SR&ED project we propose that the rationale for eligibility is what is most important.

Notable quote:

"Leaders don't create followers, they create more leaders."

- Tom Peters

CRA – SR&ED software project description as provided

New Web techniques for animation & quasi-real time interactivity in browsers

On November 1, 2012 the CRA hosted a working session during which they presented the following project example to stakeholders.

CASE B

New Web techniques for animation & quasi-real time interactivity in browsers

Technological context: The evolution of tools, platforms, operating systems, and programming languages continues to accelerate. From an approach that was originally at a very low level (machine language, assembler, etc.) and that allowed complete control of processing resources (often at the expense of complexity), we now see the creation of new, very high-level tools (in terms of functional integration). And yet, despite the fact that users have increasing access to highly sophisticated development tools to simplify their work, it must be noted that very often these tools are so specialized that they sometimes fall short with regard to the ever-growing needs of the users. Development work can thus become more complex, at different levels (system, module, components, etc.) rather than simplified.

Background: The WOW company designs and implements interactive game Web applications that are meant to offer users very high-quality animation and interactivity, almost equivalent to those of video games.

CASE B - Continued

The development of these applications is a significant challenge, given the multiple constraints associated with the Internet. For example:

- bandwidth, which varies greatly depending on each user's network capacity;
- transmission delays (latency), the limiting characteristics of communication;
- peak-load levels that can be much higher than average; and the random nature of user interactivity.

CASE B - Continued

Not reinventing the wheel:

In the context of developing these applications, to resolve the technical problems above, the company undertook several tasks:

It is attempting to select and optimize its development environment to be as efficient as possible in the pursuit of its objectives (i.e. achieving the desired software functionality and minimizing the resources required).

It is making use of a number of existing, recent technologies (some of which are still in the embryonic stages) to help in the achievement of its fluid animation and interactivity objectives (Web Services, Flash, Flex, AJAX, various scripting languages, etc.).

It is investigating all types of software/module, whether they are Open Source (Open Source Software or OSS) or commercial (third party software), with the goal of integrating as many existing components as possible—components it will not have to develop—to improve the performance of its applications.

CASE B - Continued

Discussion questions:

- At what level can technological advancement be achieved (in terms of programming level and/or reuse/modification of modules, etc.)?
- Will the Open Source nature of some software/modules/components affect eligibility?
- Will the fact that it is attempting to combine software and components, whether they are Open Source (OSS) or commercial, affect SR&ED eligibility?

Project Details: SR&ED software project description – rewritten for potential eligibility

Scientific or Technological Objectives:

Measurement	Current Performance	Objective	Has results?
Average Response time (seconds)	2	0.3	Yes
Data structures - number/complexity	(not set)	(not set)	No
Average memory use (bytes / query)	15000	5000	Yes
Maximum number of concurrent users (users)	1000	25000	Yes
CPU usage (% busy)	70	30	Yes
Stability (mean time between failures) (# transactions)	11000	100000	Yes

[NOTE: THIS PROJECT EXAMPLE IS REPRODUCED FROM DETAILS PROVIDED IN THE CRA'S NOVEMBER 1, 2012 SR&ED EXTERNAL STAKEHOLDER'S EVENT IN MISSISSAUGA, ONTARIO.

SADLY THE CRA CLAIMED THAT THEIR SAMPLE PROJECT LACKED THE DETAIL TO DETERMINE ELIGIBLITY.

AS A RESULT WE HAVE ADDED ADDITIONAL GUIDANCE & EXAMPLES OF POTENTIALLY ELIGIBLE WORK.

THIS IS INTENDED AS A STARTING POINT FOR BOTH THE CRA & CLAIMANTS TO UNDERSTAND HOW & WHY THE PROJECT MAY QUALIFY.]

The company intends to make use of a number of existing, recent technologies (some of which are in the embryonic stages) to help in the achievement of:

- Fluid animation &
- Interactivity objectives (web services, Flash/Flex, AJAX, various scripting languages, etc.)

EXAMPLES OF OTHER ISSUES WHICH COULD BE ADDRESSED INCLUDE: Consider a system that would like to run three different distributions of both:

- Windows (XP, Vista & 7)
- Linux (RedHat, Debian & Mandrake).

Technology or Knowledge Base Level:

Benchmarking methods & sources for citings:

Benchmark Method/Source	Measurement	Explanatory notes
Internet searches	16 sites / articles	Examined 16 articles & blogs on suitable methods. These provided ideas as to some of the technology hurdles to be addressed.
Competitive products or processes	14 products	Several competitors had solutions which addressed one of more of our objectives. Most of these were closed source or proprietary so we were unable to access or review the source code.
Similar prior in-house technologies	3 products / processes	We examined 3 of our existing game platforms & how they might be redeveloped / deployed into improved applications.
Potential components	2 products	We spoke with Microsoft & Linux Redhat support team for ideas on how to use their solutions. Some of these were used to develop our initial prototype.
Queries to experts	2 responses	Once a preliminary spec of the development environment was documented we hired 2 separate consultants to provide input and feedback.

CRA Background to this example:

Technological context: The evolution of tools, platforms, operating systems, and programming languages continues to accelerate.

From an approach that was originally at a very low level (machine language, assembler, etc.) and that allowed complete control of processing resources (often at the expense of complexity), we now see the creation of new, very high-level tools (in terms of functional integration).

Despite the fact that users have increasing access to highly sophisticated development to simplify their work, it must be noted that often these tools are so specialized they sometimes fall short with regards to the ever-growing needs of the users.

Development work can thus become more complex, at different levels (system, module, components, etc.) rather than simplified.

CRA Project example:

The WOW company designs and implements interactive game Web applications that are meant to offer users very high-quality animation and interactivity, almost equivalent to those of video games.

Field of Science/Technology:

Computer sciences (1.02.01)

Scientific or Technological Advancement:

Uncertainty #1: Technology constraints & related variables of experimentation

The CRA project identified technology "constraints" with respect to optimal use of the internet including methods to address;

• optimal platforms or methods use in web services vs. Flash, Flex, AJAX &/or various scripting languages,
• bandwidth, which varies greatly depending on each user's network capacity,
• transmission delays (latency), the limiting characteristics of communication &
• peak-load levels that can be much higher than average; and the random nature of user interactivity.

AUTHORS NOTE: THE IDENTIFICATION OF THESE "OBJECTIVES" & RELATED "VARIABLES OF EXPERIMENTATION" FORM THE BASIS OF THE "CONTROLLED EXPERIMENTATION."

UNLESS THE CRA CAN DEMONSTRATE THAT THESE SOLUTIONS WERE "READILY AVAILABLE" AT THE OUTSET OF THE WORK:

- ANY WORK RELATED TO THE RESOLUTION OF THESE VARIABLES
- WOULD REPRESENT ELIGIBLE ACTIVITIES.

The most significant underlying key variables are:

- **Threads vs. processes-kernel vs. user level binding,**
- **Scheduling - queue sizes, levels, priorities,**
- **Locking methods - spinlock, muteses, conditions,**
- **Web services vs. Remoting / Flash- Flex vs. AJAX,**
- **User memory-virtual, mapped files, heaps, threads**

Activity #1-1: Web services vs. Remoting / Flash- Flex vs. AJAX (Fiscal Year 2012)

Methods of experimentation:

Method	Experimentation Performed
Process trials:	120 runs / samples

THE FOLLOWING IS A POTENTIALLY ELIGIBLE ACTIVITY BASED ON THE CRA EXAMPLE:

There are several different means of bringing XML into the Flash application. The data can be brought in by a HTTP request, a SOAP-based web service, and through Flash Remoting.

Initially we compared these methods in the areas of performance, security and implementation.

WEB SERVICES, HTTP or SOAP-based transfers VS. REMOTING:

Web services, HTTP or SOAP-based data transfer are great if you are only using simple data transfers between the client and host.

Where web services fall down is when the data structures passed back and forth become too complex or when the number of different data structures passed back and forth become too large.

We recognized that remoting overcomes these problems by providing a heavyweight framework that handles the serialisation for you however remoting is not suitable for small scale or varied server protocol stuff though since

- You have to synchronise class structures between server and client;
- you can only communicate with a compatible remoting servers and
- the framework adds overhead to the client size and complexity.
- HTTP services bringing in XML requires little in the way of server modifications. Remoting requires a component to be installed on your server (unless you are using ColdFusion). Web services require programming the web service on your server.

The issue was to identify the correct balance between choosing either of these two procedures as the starting point for a custom client development project.

We preceded to test 1,000 sample queries under both scenarios and discovered that certain types of queries (types X & Y) were better suited to webservices whereas types A through E were better suited to remoting.

We then proceeded to develop a hybrid technique to use both methods.

Results:

- Average Response time: 1.8 seconds (11% of goal)
- Average memory use: 14000 bytes / query (10% of goal)
- Maximum number of concurrent users: 1500 users (2% of goal)

NOTE: THE CRA EXAMPLE SITED THE ISSUES IN THIS ACTIVITY. IN REALITY MUCH OF THIS WORK IS OFTEN MARKET RESEARCH: RELATED TO DETERMINING THE LIMITATIONS OF EXISTING TECHNOLOGIES.

THIS WOULD OFTEN BE PART OF THE "DUE DILIGENCE" PROCESS UNLESS / UNTIL THE CLAIMANT CAN IDENTIFY "VARIABLES" OF UNCERTAINTY AS THE BASIS OF THEIR EXPERIMENTATION.

Conclusion:

Whether AMF via Remoting faster than an XML Service depends on the size of the data you are passing back and forth.

In our case Scenarios X & Y were better suited to _____. Scenarios A through F were better services using AMF remoting. NOTE: IDEALLY THE CLAIMANT WOULD IDENTIFY SCENARIOS FOR WHICH THE SOLUTIONS WERE NOT "READILY APPARENT" AT THE OUTSET OF THE WORK.

Significant variables addressed: Web services vs. Remoting / Flash- Flex vs. AJAX

Activity #1-2: Prototype testing - latency issues MS Windows (Fiscal Year 2012)

Methods of experimentation:

Method	Experimentation Performed
Process trials:	300 runs / samples
	Analyzed API & hardware control loop strategies to address latency issues

Latency issues - MS Windows:

On Microsoft Windows, it appears that the timing of commands to hardware is not exact. Empirical data suggest that Windows (using the Windows sleep timer which accepts millisecond sleep times) will schedule on a 1024 Hz clock and will delay 24 of 1024 transitions per second to make an average of 1000 Hz for the update rate.

We found this can have serious ramifications for discrete-time algorithms that rely on fairly consistent timing between updates such as those found in the control theory of the video game controllers. The sleep function or similar windows APIs were at no point designed for accurate timing purposes.

As a long term solution we proposed that more accurate timings could be achieved by using dedicated hardware extensions and control-loop cards by the game system vendors.

During the current year, as a short term solution we proposed that certain multimedia-oriented API routines like timeGetTime() and its siblings could be integrated to provide better timing consistency.

We experimented with over 30 API's in various configurations including (_____list key variables of experimentation).

Results:

- Average Response time: 0.6 seconds (82% of goal)
- Average memory use: 4000 bytes / query (110% of goal)
- Maximum number of concurrent users: 18000 users (70% of goal)

Experimentation indicated that both the consumer- and server-grade Windows (as of 2011 those based on NT kernel) were not capable of operating as real-time operating systems using this method.

Conclusion:

AN IDEAL CONCLUSION MIGHT IDENTIFY:

- FACTORS OR VARIABLES THAT CAUSED CERTAIN API'S TO PERFORM BETTER &
- TO CONSIDER IN OPTIMIZING WINDOWS OR OTHER ENVIRONMENTS.

Significant variables addressed: scheduling - queue sizes, levels, priorities

Activity #1-3: threads vs. processes-kernel vs.user level binding (Fiscal Year 2012)

Methods of experimentation:

Method	Experimentation Performed
Analysis / simulation:	100 alternatives

Example of potential experimentation:

User-level threads are unknown by the kernel, whereas the kernel is aware of kernel threads.

On systems using either M:1 or M:N mapping, user threads are scheduled by the thread library and the kernel schedules kernel threads.

Kernel threads need not be associated with a process whereas every user thread belongs to a process.

The main advantage of implementing threads in the kernel rather than in a user-mode library are that:
• kernel-threaded systems can take advantage of multiple processors if they are available &
• if one thread blocks in a kernel service routine (for example, a system call or page fault), other threads are still able to run.

Kernel threads are generally more expensive to maintain than user threads as they must be represented with a kernel data structure.

Because a thread is smaller than a process, thread creation typically uses fewer resources than process creation.

Creating a process requires allocating a process control block (PCB), a rather large data structure. The PCB includes a memory map, list of open files, and environment variables. Allocating and managing the memory map is typically the most time-consuming activity. Creating either a user or kernel thread involves allocating a small data structure to hold a register set, stack, and priority.

The hybrid approach, implementing multiple user threads over a smaller number of kernel threads, allows a balance between these tradeoffs to be achieved.

Eligible activities might include work aimed at understanding the methods to optimize these balance between these methods.

Results:

- Average Response time: 0.7 seconds (76% of goal)
- Average memory use: 8000 bytes / query (70% of goal)
- Maximum number of concurrent users: 13000 users (50% of goal)

The hybrid approach, implementing multiple user threads over a smaller number of kernel threads, allows a balance between these tradeoffs to be achieved.

Conclusion:

The hybrid approach, required the development of algorithms to classify each query as to whether it is better suited to:

- implement multiple user threads over
- a smaller number of kernel threads,

for optimal performance to be achieved.

Significant variables addressed: threads vs. processes-kernel vs.user level binding

Activity #1-4: scheduling - queue sizes, levels, priorities (Fiscal Year 2012)

Methods of experimentation:

Method	Experimentation Performed
Analysis / simulation:	1000 alternatives

Preemptive scheduling allows a process to be interrupted in the midst of its execution, taking the CPU away and allocating it to another process. Non-preemptive scheduling ensures that a process relinquishes control of the CPU only when it finishes with its current CPU burst.

Consider a system that supports the strategies of contiguous, linked, and indexed allocation. What criteria should be used in deciding which strategy is best utilized for a particular file?
Answer:
• Contiguous—if file is usually accessed sequentially, if file is relatively small.
• Linked—if file is large and usually accessed sequentially.
• Indexed—if file is large and usually accessed randomly

In reality the developer will need to develop the parameters to define and implement this process.

Results:

- CPU usage: 45 % busy (62% of goal)

Conclusion:

An ideal conclusion might provide details as to WHY any of the following methods were more suited to this scenario:

- Scheduling: Preemptive vs. Nonpreemptive

- File allocation: contiguous vs. linked vs.& indexed

Significant variables addressed: scheduling - queue sizes, levels, priorities

Activity #1-5: locking methods - spinlock, muteses, conditions (Fiscal Year 2012)

Methods of experimentation:

Method	Experimentation Performed
Process trials:	450 runs / samples

Solaris, Windows XP, and Linux implement multiple locking mechanisms depending on the application developers' needs.

Spinlocks are useful for multiprocessor systems where a thread can run in a busy-loop for a short period of time) rather than incurring the overhead of being put in a sleep queue.

Mutexes are useful for locking resources. Solaris 2 uses adaptive mutexes, meaning that the mutex is implemented with a spin lock on multiprocessor machines.

Semaphores and condition variables are more appropriate tools for synchronization when a resource must be held for a long period of time, since spinning is inefficient for a long duration.

Some schedules are possible under certain protocols. eg. the two-phase locking protocol but not possible under the timestamp protocol, and vice versa.

Results:

- Average Response time: 0.4 seconds (94% of goal)
- Stability (mean time between failures): 75000 # transactions (71% of goal)

Conclusion:

An ideal conclusion would provide further details as to:
- WHY a particular combination of locking methods /strategies
- was most appropriate in this particular scenario.

Significant variables addressed: locking methods - spinlock, muteses, conditions

Activity #1-6: User memory-virtual, mapped files, heaps, threads (Fiscal Year 2012)

Methods of experimentation:

Method	Experimentation Performed
Physical prototypes:	6 samples (with 600 revisions)

Some of the ways an application can use memory via the Win32 API.

1) Virtual memory provides several functions that allow an application to reserve and release memory, specifying the virtual address at which the memory is allocated.

2) A file may be memory mapped into address space, providing a means for two processes to share memory.

3) When a Win32 process is initialized, it is created with a default heap. Private heaps can be created that provide regions of Windows XP reserved address space for applications. Thread management functions are provided to allocate and control thread access to private heaps.

(4) A thread-local storage mechanism provides a way for global and static data to work properly in a multithreaded environment. Thread-lock storage allocates global storage on a per-thread basis.

Developers may experiment with using alternate methods in differing circumstances.

Results:

- Average Response time: 0.25 seconds (102% of goal)
- Average memory use: 7000 bytes / query (80% of goal)
- Maximum number of concurrent users: 22000 users (87% of goal)
- CPU usage: 34 % busy (90% of goal)

Conclusion:

An ideal conclusion would provide further details as to:

- WHY a particular type of combination of memory allocation methods /strategies
- was most appropriate in this particular scenario.

Significant variables addressed: User memory-virtual, mapped files, heaps, threads

Key Criteria Summary

R&D Base demo

1202 - Software - New Web techniques for animation & quasi-real time interactivity in browsers

Benchmarks:
Internet searches: 16 sites / articles
Competitive products or processes: 14 products
Similar prior in-house technologies: 3 products /
Potential components: 2 products
Queries to experts: 2 responses

Objectives:
Average Response time: 0.3 seconds
Data structures - number/complexity:
Average memory use: 5000 bytes / query
Maximum number of concurrent users: 25000 users
CPU usage: 30 % busy
Stability (mean time between failures): 100000 # transactions

Uncertainty: 1 - Technology constraints & related variables of experimentation

Key Variables: locking methods - spinlock, muteses, conditions, scheduling - queue sizes, levels, priorities, threads vs. processes-kernel vs.user level binding, User memory-virtual, mapped files, heaps, threads, Web services vs. Remoting / Flash- Flex vs. AJAX

Activity	Testing Methods	Results - % of Objective	Variables Concluded	Hours	Materials $	Subcontractor $	Fiscal Year
1 - Web services vs. Remoting / Flash- Flex vs. AJAX	Process trials: 120 runs / samples	Average Response time: 1.8 seconds (11 %) Maximum number of concurrent users: 1500 users (2 %) Average memory use: 14000 bytes / query (10 %)	Web services vs. Remoting / Flash- Flex vs. AJAX	300.00	0.00	0.00	2012
2 - Prototype testing - latency issues MS Windows	Process trials: 300 runs / samples	Average Response time: 0.6 seconds (82 %) Average memory use: 4000 bytes / query (110 %) Maximum number of concurrent users: 18000 users (70 %)	scheduling - queue sizes, levels, priorities	200.00	0.00	0.00	2012
3 - threads vs. processes-kernel vs.user level binding	Analysis / simulation: 100 alternatives	Maximum number of concurrent users: 13000 users (50 %) Average memory use: 8000 bytes / query (70 %) Average Response time: 0.7 seconds (76 %)	threads vs. processes-kernel vs.user level binding	250.00	0.00	0.00	2012
4 - scheduling - queue sizes, levels, priorities	Analysis / simulation: 1000 alternatives	CPU usage: 45 % busy (62 %)	scheduling - queue sizes, levels, priorities	100.00	0.00	0.00	2012
5 - locking methods - spinlock, muteses, conditions	Process trials: 450 runs / samples	Stability (mean time between failures): 75000 # transactions (71 %) Average Response time: 0.4 seconds (94 %)	locking methods - spinlock, muteses, conditions	120.00	0.00	0.00	2012
6 - User memory-virtual, mapped files, heaps, threads	Physical prototypes: 6 samples ... prototype revisions: 600 revisions	Average Response time: 0.25 seconds (102 %) Average memory use: 7000 bytes / query (80 %) Maximum number of concurrent users: 22000 users (87 %) CPU usage: 34 % busy (90 %)	User memory-virtual, mapped files, heaps, threads	160.00	0.00	0.00	2012

Notable quote

"I couldn't repair your brakes, so I made your horn louder."

- Steven Wright

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Notable quote

““Innovation is the ability to convert ideas into invoices.”

- L. Duncan

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CRA DRAFT project examples released Sep 2013

- 1301 Pump redesign
- 1302 Oil seed extraction process
- 1303 HVAC - How cost constraints affect a project
- 1304 Greenhouse management strategy - INELIGIBLE
- 1305 Glue development - Hypotheses formulation example
- 1306 Food development - INELIGIBLE TRIAL & ERROR
- 1307 Potato peeler - WHAT IF SCENARIOS
- 1308 Hockey stick design - SAMPLE SIZE
- 1309 Chemical formulation - DATA COLLECTION SCENARIOS
- 1310 Electronics – SR&ED vs. business portion of the project

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C – CRA draft projects Sep 18, 2013
Example #1: 1301 Pump redesign

Case 1 – Technical problem

- A chemical company is developing a new process for producing one of their chemical products. One of the components of the process is a series of pumps. However, the pumps started corroding after six months rather than after the expected life of 10 years.
- The pump supplier was contacted about the problem. They carried out an investigation and traced the problem to an intermittent leak in a filter that allowed corrosive liquid into the unit. The problem was corrected by replacing the filters in the pumps.
- In this scenario, the problem with the pumps in the new process was technical and not technological.
- The technical problem was resolved using standard practice (the company's trouble-shooting procedures) to find the cause of the corrosion and the problem was solved by replacing the filters.

Case 2 – Technological uncertainty – pump redesign

- Consider a **different scenario** where a set of pumps fails after six months rather than after the expected life of 10 years. The pump supplier was contacted about the problem. They investigated by following their trouble-shooting guide and found that the failure was due to a leak in the seal on the shaft of the pump, which allowed corrosive liquid into the unit.
- They replaced the seals in all the pumps, but the pumps failed again after six months. Again, the pump supplier found that the cause of the failure was the same.
- They investigated further and discovered that the temperature of the shaft after a prolonged period of operation exceeded the maximum recommended operating temperature of the seal material.
- They also found that the failure of the seal was partly caused by the design of the seal on the shaft as well as the material used for the seal. Under prolonged operation, the seal failed and allowed the corrosive liquid into the unit.
- Once the cause of the problem was discovered, the supplier began an experimental development project to find out which of several redesigns of the seal and seal materials would be compatible for the operating environment of the pump.

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Case 2 – Technological uncertainty – pump redesign (ctnd.)

- Data on the behaviour and physical properties of the seal materials at much lower temperature ranges were available from the manufacturers. However, there was no information or data available on the corrosive behaviour of materials or their physical properties at the elevated temperatures in the environment that the pump is operating.

- The supplier undertook a series of experiments to investigate the material behaviour and seal design.

- In this scenario, the pump supplier faces technological uncertainties (design of the seal and material behaviour at operating conditions) and undertook experimental development work to resolve them.

Conclusion

- This example illustrates the difference between a technical problem that can be resolved by applying practices, techniques, or methodologies that the company knows about or that are available in the public domain, and a technological uncertainty that requires experimental development.

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1301 - Pump redesign

Benchmarks: Internet searches: 5 Articles
Similar prior in-house technologies: 1 products /
Potential components: 1 products

Objectives: Maximum operating temperature: 250 Deg C
PUMP COST: 500 $

Uncertainty: 1 - CRA illustration of technological uncertainty

Key Variables: seal designs (shapes, thicknesses, angles), seal materials

Activity	Testing Methods	Results - % of Objective	Variables Concluded	Hours	Materials $	Subcontractor $	Fiscal Year
1 - Development	Analysis / simulation: 110 alternatives Process trials: 45 runs / samples Physical prototypes: 3 samples ... prototype revisions: 44 revisions	Maximum operating temperature: 220 Deg C (78 %)	seal materials	0.00	0.00	0.00	2013

1302 Oil seed extraction process - TU

- This example shows that technological uncertainties may arise from limitations in current technology, and technological uncertainty exists when it is not known whether a given result or objective can be achieved or how to achieve it based on generally available scientific or technological knowledge or experience.

Example

- The current technology of extracting oil from oilseeds is based on a batch process, in which seeds are crushed, conditioned, and flaked.
- The residue after removing the oil consists mainly of protein-rich flour and seed coats with some trapped oil. This residue (or meal) is then ground and the remaining trapped oil is extracted with a solvent. The solvent is recovered from both the meal and the extracted oil by toasting and distillation. The meal is generally sold as an animal feed product.
- The main limitation of the current technology is that the meal is a mixture of the protein-rich flour and seed coats. Seed coats have no nutritional value, and are visually undesirable as a potential ingredient in foods for human consumption. Also, the conditioning and flaking at 80-100°C harms the nutritional value of the oil and the flour.
- Therefore, there is a need to develop a low-temperature oil-extraction process, including separating protein-rich flour from seed coats, to produce a protein-rich product suitable for human consumption.
- The specific technological problem is how to separate the seed coats from the protein flour at low temperature. It is difficult to physically separate seed coats and protein flour because they have very similar physical properties and the protein flour is firmly bonded to the seed coats.

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1302 Oil separation (ctnd.)

Conclusion

- Though there were several technologies available to separate solid particles with different physical properties, no effective low temperature technologies were available to separate solid particles with very similar physical properties where the particles themselves were bonded together.
- One technology which had been tried at a small scale was ultrasonic maceration. However, since there was no publicly available information on the use of ultrasonic maceration for this particular type of oilseed, the operating parameters needed to test the technology were not in the public domain.
- Also, it was not known whether the continuous process needed on a large scale, including the ultrasonic maceration and simultaneous solvent extraction, could be developed.
- There was technological uncertainty in developing a continuous method to process oilseeds at low temperatures because no one knew whether the objective could be achieved and how to achieve it.

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1302 - Oil seed extraction process

Benchmarks: Internet searches: 5 Articles
Competitive products or processes: 1 products
Similar prior in-house technologies: 1 products /

Objectives: Extraction temperature : 50 Deg C
COST OF MACHINE: 75000 $
RECLAMATION EFFICIENCY: 70 % recovery
OIL PURITY: 98 %

Uncertainty: 1 - Scientific & system uncertainty

Key Variables: effects of ultrasonic maceration, key operating parameters ** - EXPAND, solvent extraction method **- EXPAND

Activity	Testing Methods	Results - % of Objective	Variables Concluded	Hours	Materials $	Subcontractor $	Fiscal Year
1 - Development	Analysis / simulation: 154 alternatives Process trials: 7 runs / samples Physical prototypes: 1 samples ... prototype revisions: 17 revisions	Extraction temperature : 60 Deg C (66 %)	effects of ultrasonic maceration key operating parameters ** - EXPAND solvent extraction method **- EXPAND	0.00	0.00	0.00	2013

1303 HVAC - How cost constraints affect a project

- This example shows that cost targets are not technological uncertainties, but a technological uncertainty may arise by trying technologically uncertain paths to solve a problem to meet the cost targets.

Example

- A company wants to develop an air recirculation system for energy-efficient homes that will permanently remove carbon monoxide. A key component of this system is a module in which carbon monoxide (CO) is converted to relatively harmless carbon dioxide (CO2) at room temperature.
- A process is available that uses a tin oxide and platinum catalyst to convert CO to CO2 at room temperature, and the company could develop a product based on this process. However, the high cost of using this process will make the selling price of the product out of reach for consumers.
- There are other methods to convert carbon monoxide, but they are not effective at room temperature. A key requirement is that the module must operate at room temperature.
- To achieve the project objective (a room-temperature carbon monoxide remover), the company has to develop an inexpensive process that operates effectively at room temperature.
- The technological uncertainty relates to how to convert CO to CO2 at room temperature that does not use the costly process with tin oxide and platinum.

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1303 HVAC – cntd.

Conclusion

- Although the cost target by itself is not a technological uncertainty, a technological uncertainty may arise from the need to avoid using a costly process, even though that process is known to work.
- The required cost target is also the motivation or reason for the company to undertake work to remove this uncertainty.

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1303 - HVAC - How cost contraints affect a project

Benchmarks: (none)

Objectives: Cost: 200 $ / unit
Minimum conversion temperature: 20 Deg C

Uncertainty: 1 - Convert CO to CO2 at room temp

Key Variables: how to convert CO to CO2 at room temp

Activity	Testing Methods	Results - % of Objective	Variables Concluded	Hours	Materials $	Subcontractor $	Fiscal Year
1 - Development	Analysis / simulation: 25 alternatives	Cost: 180 $ / unit (120 %) Minimum conversion temperature: 23 Deg C (80 %)	how to convert CO to CO2 at room temp	0.00	0.00	0.00	2013

1304 Greenhouse management strategy - INELIGIBLE

- This example shows standard practice, which means applying known techniques to a new situation where it is reasonably certain that the technique will achieve the desired result.

Example

- After testing a newly developed plant variety, a greenhouse grower feels that there is a chance for commercial success and attempts to find the optimum conditions to maximize production.
- Depending on the zone size that can be controlled in the greenhouse, anywhere from 2 to 10 acres is planted with the promising variety.
- The grower monitors the growth of the crop and, depending on its performance, makes adjustments to guide the crop to optimal production. These adjustments are often called the “development of cultural management strategies or crop husbandry strategies.”
- However, greenhouse growers are aware of optimization techniques for factors such as lighting, temperature, CO2 and humidity. Also, developing and implementing management protocols for controlling nutrient levels, de-leafing, thinning, and other operational practices are familiar to them.

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1304 Greenhouse management strategy (cntd.)

Conclusion

- These well-known and practiced techniques are standard in this industry, as growers are reasonably certain that the techniques, data, and procedures, when applied in this case, would work.
- So, although the grower may not be certain of the specific parameters, determining them using these approaches is part of the standard practice of this industry.
- In this case, there is no scientific or technological uncertainty in determining the optimum conditions to maximize production of a new plant variety.

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1304 - Greenhouse management strategy - INELIGIBLE

Benchmarks: Internet searches: 1 Articles
Patent searches: 1 patents
Competitive products or processes: 1 products
Similar prior in-house technologies: 1 products /
Potential components: 1 products
Queries to experts: 1 responses

Objectives: YIELD / ACRE: 120 KG

Uncertainty: 1 - Greenhouse optimization

Key Variables: CO2, humidity, light, nutrient levels, temperature

Activity	Testing Methods	Results - % of Objective	Variables Concluded	Hours	Materials $	Subcontractor $	Fiscal Year
1 - Crop husbandry	(none)	(none)	CO2 humidity light nutrient levels temperature	0.00	0.00	0.00	2013

1305 Glue development - Hypotheses formulation

- This example illustrates the concept of formulation of a hypothesis to resolve a problem.

Example

- The research and development (R&D) department of a company was asked to come up with a solution to improve the bond strength of their premier glue product to compete with another product.
- The R&D chemist who was assigned to the project recently came across a published research paper whose authors had used an additive (acting as bonding agent) to increase the bonding strength of two chemicals that belong to the same class of materials as used in the company's premier glue product.
- However, the conditions (temperature, pressure, humidity) under which the authors used the additive were quite different than those used by the company in manufacturing the glue. The chemist carried out further searches in both scientific and technical publications on the use of this additive but found nothing more.
- There was no way of predicting whether the additive would work in enhancing the bond strength of the glue considering the conditions under which the glue was manufactured.
- The chemist hypothesized that, based on the similarity of the chemical properties of the glue ingredients and the two chemicals used in the research paper, the use of the new bonding agent in the manufacture of the glue under the right conditions should increase the bond strength of the glue.

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1305 Glue development - Hypotheses formulation

Conclusion

- This example simply illustrates the concept of a hypothesis—an idea, consistent with known facts, that serves as a starting point for further investigation to prove or disprove that idea.

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1305 - Glue development - Hypotheses formulation example

Benchmarks: Internet searches: 5 Articles
Competitive products or processes: 1 products
Similar prior in-house technologies: 5 products /

Objectives: BOND STRENGTH: 600 KG
COST / LITRE: 30 $

Uncertainty: 1 - Additive effects & formulation

Key Variables: additive - amounts, timing, humidity, pressure, temperature

Activity	Testing Methods	Results - % of Objective	Variables Concluded	Hours	Materials $	Subcontractor $	Fiscal Year
1 - Development	Analysis / simulation: 25 alternatives	BOND STRENGTH: 650 KG (150 %) COST / LITRE: 30 $ (100 %)	humidity pressure temperature	0.00	0.00	0.00	2013

1306 Food development - INELIGIBLE TRIAL & ERROR

- This example shows that when a series of tests are executed without any systematic plan and no attempt is made to analyze the results from each test, it is considered trial and error. Such work is not scientific research and experimental development (SR&ED).

Example

- A company that has been involved in preparing food products for several years wanted to develop a low-calorie pocket pizza product.
- They proceeded by attempting to create the low-calorie pizza based on their knowledge of preparing standard pizza products.
- In their first attempt, they used different amounts of sauce, reduced the amount of cheese, and replaced the regular pepperoni with low-fat turkey pepperoni, without changing the layer structure of the pizza. This attempt was considered a failure because the low-fat pepperoni burned during cooking.
- The next series of attempts involved preparing and testing a different order of layering the ingredients. This attempt also failed because the large size of the pieces of pepperoni led to undercooking.
- The third attempt reduced the size of the pepperoni pieces by half. This attempt was somewhat successful, but still not good enough.
- The fourth attempt reduced the thickness of the low-fat pepperoni pieces. This fourth attempt was considered a success and the company proceeded to commercialize the product.

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1306 Food development - INELIGIBLE TRIAL & ERROR

Conclusion

- The only lesson learned from each attempt was that it failed. There was no work at any stage to analyze the results from each trial and take corrective action based on the results.
- In other words, there was no planned approach, including identifying a technological uncertainty, formulating a hypothesis to eliminate that uncertainty, testing the hypothesis, analyzing the results to draw conclusions, and carrying out more experimentation, if needed.
- The work described in this example is trial and error.

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1306 - Food development - INELIGIBLE TRIAL & ERROR

Benchmarks: (none) **Objectives:** (none)

Uncertainty: 1 - Business vs. technological uncertainty **Key Variables:** ingredient selection, order of ingredients, size / shape of ingredients

Activity	Testing Methods	Results - % of Objective	Variables Concluded	Hours	Materials $	Subcontractor $	Fiscal Year
1 - Trial & error development process	Process trials: 4 runs / samples	(none)	ingredient selection order of ingredients size / shape of	0.00	0.00	0.00	2013

Notable quote

"Everyone has a photographic memory; some just don't have film"

- Steven Wright

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1307 Potato peeler – WHAT IF SCENARIOS

- The following example shows how creating new materials, devices, products, or processes, or improving existing ones, can be achieved with or without technological advancement.

Examples

Case 1

- The basic design of the potato peeler has not changed for more than 100 years. A company decided to develop a novel peeler by adding a phosphorescent substance to the plastic handle so that it would be easier to find in a dark kitchen drawer. There was no change to the shape of the handle or to the blade. Adding the phosphorescent substance did not entail any change to the molding process and did not affect the physical properties of the handle or the performance of the peeler. While this was a new product, there was no technological advancement in creating this “glow-in-the-dark” peeler.

Case 2

- The same company wanted to develop a new potato peeler with the same blade but wanted to modify the handle to make it easier to use. The new handle would be larger, easier to grip, and less likely to slip in the hand of the user.
- This would be achieved by making it softer yet rigid enough to retain its shape, and its surface would have to be rough enough to prevent it from slipping in a wet hand. It would also have to be dishwasher safe.
- The company found that their requirements could not be satisfied with any plastic that was available at the time. They decided to try to use a new polymer.

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1307 Potato peeler – WHAT IF SCENARIOS

Case 2 (cntd.)

- In developing the new handle, they encountered difficulties in the injection molding process. Using the new polymer in their existing molding process did not produce a handle with the desired physical properties.
- The company found that the working temperature for the new polymer had to be much higher than what the current molding process was designed to operate at.
- Eventually, a new injection molding process had to be developed that used the new polymer to produce the product that had the desired physical properties.
- The acquired know-how to develop the new injection molding process represented a technological advancement for the company.

Conclusion

- New products hit the market every day. This example shows that creating a new or innovative product does not necessarily mean that SR&ED work was done.

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1307 - Potato peeler - WHAT IF SCENARIOS

Benchmarks: Competitive products or processes: 5 products
Similar prior in-house technologies: 3 products /
Potential components: 12 products

Objectives: Dishwasher safe: 1200 # cycles
COST: 1.5 $/UNIT
Profile roughness (Rp): 1 micro inches
Area Roughness (Ra): 1.5 micro inches

Uncertainty: 1 - Technological uncertainty- Case 2

Key Variables: adaption of injection molding process, optimal polymer material, working temperature

Activity	Testing Methods	Results - % of Objective	Variables Concluded	Hours	Materials $	Subcontractor $	Fiscal Year
1 - Case 1 - INELIGIBLE	(none)	(none)	(none)	0.00	0.00	0.00	2013
2 - Case 2 - ELIGIBLE	Analysis / simulation: 47 alternatives Process trials: 11 runs / samples Physical prototypes: 1 samples ... prototype revisions: 4 revisions	Dishwasher safe: 1200 # cycles (100 %) COST: 1.3 $/UNIT (140 %) Profile roughness (Rp): 2 micro inches (0 %) Area Roughness (Ra): 1.4 micro inches (120 %)	adaption of injection molding process optimal polymer material working temperature	0.00	0.00	0.00	2013

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1308 Hockey stick design - SAMPLE SIZE

- The following example illustrates the concept that only the amount, size, extent, or duration of work that is necessary for and directly in support of the basic research, applied research, or experimental development work undertaken in Canada is eligible.

Example

- A company produces field-hockey sticks in large numbers to supply the world market. The production stage of the sticks mainly consists of a machine that accepts pre-cut lengths of timber and produces the cut forms for further processing.

- The company started a project involving experimental development work to integrate an advanced scanning and laser cutting technology to cut and rasp hockey sticks in a single machine.

- Based on statistical analysis and their in-house knowledge of the existing machinery, the company determined that 500 sticks from the cutting and rasping machine would generate sufficient out-of-tolerance sticks to test and validate, with 95% confidence, that the development could be considered complete and successful.

- The company, on receiving a large order, produced 2,000 sticks.

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1308 Hockey stick design - SAMPLE SIZE

Conclusion

- In this case, the testing and data collection associated with cutting and rasping the first 500 sticks is commensurate with the needs and directly in support of the SR&ED work.

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1308 - Hockey stick design - SAMPLE SIZE

Benchmarks: Internet searches: 5 Articles
Similar prior in-house technologies: 1 products /

Objectives: TOLERANCE: 0.3 mm
PRODUCTION RATE: 3.5 units / minute
REJECT RATE: 1 %

Uncertainty: 1 - Design

Key Variables: LASER POSITION, TYPE OF SCAN

Activity	Testing Methods	Results - % of Objective	Variables Concluded	Hours	Materials $	Subcontractor $	Fiscal Year
1 - Design - eligible test size	Process trials: 2000 runs / samples	TOLERANCE: 0.3 mm (100 %) PRODUCTION RATE: 4 units / minute (133 %) REJECT RATE: 2 % (0 %)	(none)	0.00	0.00	0.00	2013

1309 Chemical formulation – DATA COLLECTION SCENARIOS

This example shows that it is the purpose of the work, rather than the nature of the work, that distinguishes support work from excluded work.

Example

- In a chemical plant, one of the daily duties of a lab technologist is to take samples from various points throughout the process, perform various analytical tests, and then enter the results into the plant's database. This database is used by many facets of the organization to monitor, optimize, and control the process.

Case 1

- A research chemist for the company accesses the plant database and uses the data in a research project (assume that this is an SR&ED project). Although the data collected and entered into the plant database is useful to (and used for) an SR&ED project, the data collection and testing performed by the lab technologist are done routinely and not specifically for the SR&ED work.

- In this case, the daily data collection and testing are considered routine data collection and routine testing and cannot be claimed as part of the SR&ED project.

1309 Chemical formulation – DATA COLLECTION SCENARIOS

Case 2

- A research chemist is carrying out an SR&ED project. Much of the data being used again comes from the plant database. Here, however, the researcher also asks the lab technologist to collect specific samples and run specified tests over and above the work that the technologist routinely performs on a daily basis.

- For this particular research work, the chemist uses both the data and the results from data collection and testing that the technologist carries out specifically for the chemist's research project are directly in support of SR&ED.

- However, the data collection and testing the technologist performs on a daily basis, as in case 1, are routine data collection and routine testing and are excluded from the SR&ED project.

Conclusion

- This example shows how the same type of work—collecting and analyzing samples in a commercial process—may or may not be SR&ED work depending on the purpose of the work being done.

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1309 - Chemical formulation - DATA COLLECTION WHAT IF SCENARIOS

Benchmarks: Similar prior in-house technologies: 1 products /

Objectives: (none)

Uncertainty: 1 - Technological Uncertainty

Key Variables: (none)

Activity	Testing Methods	Results - % of Objective	Variables Concluded	Hours	Materials $	Subcontractor $	Fiscal Year
1 - Case 1 -INELIGIBLE	(none)	(none)	(none)	0.00	0.00	0.00	2013
2 - Case 2 - ELIGIBLE	(none)	(none)	(none)	0.00	0.00	0.00	2013

1310 Electronics – SR&ED vs. business portion of the project

- This example shows that an SR&ED project usually occurs as a subset of a company project.

Example

- A company wanted to develop an improved electronic product by incorporating a specific component that would add a new functionality.
- The company prepared a project plan including budget, created a new cost centre, and allocated staff to work on the project. The company then proceeded with the technological feasibility study, preparing the technical specifications, designing, building the prototype, testing, and making the final incorporation of the component into the product before starting the commercial production, marketing, and sales.
- In this case, the company project encompasses all the activities from initial idea to final product launch.
- During development, a problem arose with the size of the new component in relation to the size of the existing product. Knowledge of miniaturization in the field of microelectronics was required to fit the new component into the existing product. The company did not possess that knowledge.
- As a result, the company contracted out the miniaturization work. The contractor performed SR&ED work on behalf of the company. The work succeeded in reducing the size of the specific component so that it would fit into the current product.
- Once the specific component was successfully developed, it was incorporated into the existing product without any difficulty and the rest of the development was accomplished by standard practice.

1310 Electronics – SR&ED vs. business portion of the project

Example (cntd.)

- Once the specific component was successfully developed, it was incorporated into the existing product without any difficulty and the rest of the development was accomplished by standard practice.

Conclusion

- In this example, the SR&ED project encompasses the work done to miniaturize the specific component, which is a subset of the overall company project.

1310 - Electronics - defining SR&ED portion of total project

Benchmarks: Similar prior in-house technologies: 1 products / Queries to experts: 1 responses

Objectives: Component size: 25 cm 2

Uncertainty: 1 - miniaturization

Key Variables: (none)

Activity	Testing Methods	Results - % of Objective	Variables Concluded	Hours	Materials $	Subcontractor $	Fiscal Year
1 - Mininaturization design	Physical prototypes: 5 samples ... prototype revisions: 28 revisions	Component size: 21 cm 2 (180 %)	(none)	0.00	0.00	0.00	2013

New CRA pronouncements & procedures – DRAFT PROJECT DESCRIPTIONS

On Sept 18, 2013 the Canada Revenue Agency (CRA) released a DRAFT document [1] containing;

- 10 specific project examples,
- each aiming to illustrate one or more specific issues.

They are requesting feedback by 18-Nov-2013.

In the author's view these examples:

- provide both insight but also ambiguity since
- project eligibility requires the "scientific method" be followed &
- ANY missing link could spell failure.

Viewing specific components of a project in isolation therefore requires assumptions be made regarding the other components.

Some of the key weaknesses of these examples include failure to clearly define:

- "standard practice" methods
- quantified "objectives" &/or related
- "variables" of uncertainty / experimentation

As a result the CRA begins the paper by qualifying that;

> "These examples are intended to illustrate specific concepts found in the Eligibility of Work for SR&ED Investment Tax Credits Policy. The field of work described is not an issue, nor whether the work is actually eligible."

Despite the qualification the examples then go on to illustrate how & why certain work may be eligible.

In the author's view the examples,

- while lacking certain key details,
- provide a basis to further develop complete SR&ED project descriptions.

Rewriting the projects

In the following pages we have

- **Entered these DRAFT projects**
- **Into the COMPLETE T661 project reporting template**
- **To illustrate both**
  - **SR&ED indicators of eligibility &**
  - **Information that is lacking**

An overview of the "key SR&ED" criteria is

- outlined on the next page &
- summarized at the end of each description.

Notable quote:

"The first rule of any technology used in a business is that automation applied to an efficient operation will magnify the efficiency.

The second is that automation applied to an inefficient operation will magnify the inefficiency."

- Bill Gates

[1] Draft examples to illustrate key concepts in the Eligibility of Work for SR&ED Investment Tax Credits Policy

The Draft examples have been rewritten within the full SR&ED project reporting template.

We will focus on the following "key elements" of an eligible SR&ED project.

RDBASE.NET International SR&ED template

			Recommended documentation	GOAL: prove to Government (CRA, IRS, patent office)
I		**OBJECTIVE BEYOND STANDARD PRACTICE**		
	i)	**State of Existing technology**	State benchmarking methods & sources	Limits of information available to someone "skilled in the art."
	ii)	**Objective(s)**	Top 5 measureable "Objectives"	Quantifiable Objectives beyond known limits
II		**TECHNOLOGICAL UNCERTAINTIES**	Top 5 "Variables" for experimentation	Formulate "test matrix" to test hypotheses
III		**EXPERIMENTAL ACTIVITY**	Defined by tax year*	
	i)	**Experimentation method**	Number of alternatives tested & how?	Justify sample sizes
	ii)	**Results**	Correlate to "Objectives"	Provide basis for Conclusions
	iii)	**Conclusions**	Correlate to "Variables"	"New knowledge" illustrates "Technological Advancement"

1301 Pump redesign

Scientific or Technological Objectives:

Measurement	Current Performance	Objective	Has results?
Maximum operating temperature (Deg C)	110	250	Yes
PUMP COST ($)	500	500	No

The following details are excerpts from the CRA release on Sept 18, 2013 entitled;

"Draft examples to illustrate key concepts in the Eligibility of Work for SR&ED Investment Tax Credits Policy"

Example 1 – Illustrating concepts from paragraph 3, section 2.1.1 Eligibility of Work for SR&ED Investment Tax Credits Policy

In this paper the CRA states:

"2.1.1 Was there a scientific or a technological uncertainty—an uncertainty that could not be removed by standard practice?

Scientific or technological uncertainty means whether a given result or objective can be achieved or how to achieve it, is not known or determined on the basis of generally available scientific or technological knowledge or experience.

Specifically, it is uncertain if the goals can be achieved at all or what alternatives (for example,

- paths,
- routes,
- approaches,
- equipment configurations,
- system architectures, or
- circuit techniques)

will enable the goals to be met based on the existing technology base or level."

AUTHOR'S NOTE: SUGGESTED ADDITIONS WE HAVE USED CAPITAL LETTERS TO ADD:

- SUGGESTED CONTENT &
- RELATED COMMENTS.

Technology or Knowledge Base Level:

Benchmarking methods & sources for citings:

Benchmark Method/Source	Measurement	Explanatory notes
Internet searches	5 Articles	IDEALLY THE CLAIMANT WOULD OUTLINE ALL RESOURCES THEY EXAMINED BEFORE EMBARKING ON THE PROJECT. THE CURRENT DESCRIPTION DOES NOT ADDRESS THIS ISSUE.
Similar prior in-house technologies	1 products / processes	
Potential components	1 products	THE CLAIMANT APPEARS TO HAVE ONLY SPOKEN TO THE PUMP SUPPLIER. IN A REAL LIFE SITUATION THEY MAY ALSO CONTACT OTHER SUPPLIERS WHICH WOULD FURTHER DEFINE THE STANDARD PRACTICE.

1) CAUSE OF THE PROBLEM:

A chemical company is developing a new process for producing one of their chemical products. One of the components of the process is a series of pumps. However, the pumps started corroding after six months rather than after the expected life of 10 years.

They investigated by following their trouble-shooting guide and found that the failure was due to a leak in the seal on the shaft of the pump, which allowed corrosive liquid into the unit. They replaced the seals in all the pumps, but the pumps failed again after six months. Again, the pump supplier found that the cause of the failure was the same.

They investigated further and discovered that the temperature of the shaft after a prolonged period of operation exceeded the maximum recommended operating temperature of the seal material.

They also found that the failure of the seal was partly caused by the design of the seal on the shaft as well as the material used for the seal. Under prolonged operation, the seal failed and allowed the corrosive liquid into the unit.

2) LIMITS OF KNOWLEDGE ON MATERIALS TO CORRECT PROBLEM

Data on the behaviour and physical properties of the seal materials at much lower temperature ranges were available from the manufacturers. However, there was no information or data available on the corrosive behaviour of materials or their physical properties at the elevated temperatures in the environment that the pump is operating.

Field of Science/Technology:

Mechanical engineering (2.03.01)

Project Details:

Intended Results:	Improve existing processes
Work locations:	Commercial Facility
Key Employees:	Al Nobel (Chemical Engineering - P.Eng. (1989) / Research Associate)
Evidence types:	Progress reports, minutes of project meetings; Project planning documents

Scientific or Technological Advancement:

Uncertainty #1: CRA illustration of technological uncertainty

Once the cause of the problem was discovered, the supplier began an experimental development project to find out which of several redesigns of the seal and seal materials would be compatible for the operating environment of the pump.

AUTHORS NOTE: THE EXAMPLE LISTS SEAL DESIGNS AS ONE OF THE MAIN "VARIABLES" OF EXPERIMENTAION. IN REALITY THIS WOULD LIKELY ADDRESS MANY VARIABLES INCLUDING, SHAPES, ANGLES & THICKNESSES TO NAME A FEW.

The most significant underlying key variables are: seal materials, seal designs (shapes, thicknesses, angles) (unresolved)

Activity #1-1: Development (Fiscal Year 2013)

Methods of experimentation:

Method	Experimentation Performed
Analysis / simulation:	110 alternatives
Process trials:	45 runs / samples
Physical prototypes:	3 samples (with 44 revisions)

The supplier undertook a series of experiments to investigate the material behaviour and seal design.

Results:

- Maximum operating temperature: 220 Deg C (78% of goal)

Conclusion:

According to the CRA,

> "In this scenario, the pump supplier faces technological uncertainties (design of the seal and material behaviour at operating conditions) and undertook experimental development work to resolve them."
>
> AUTHOR'S NOTE: THE EXAMPLE APPEARS TO IDENTIFY VARAIBLES OF EXPERIMENTATION FOR WHICH THE SOLUTION IS NOT "READILY AVAILABLE."
>
> THIS LEAVES QUESTIONS AS TO WHEN THE ACTUAL PROJECT STARTED: AT THE START OF THE PROBLEM OR WHEN IT WAS DIAGNOSED AND THE REDESIGN WORK BEGAN.

Significant variables addressed: seal materials

Documentation:

- Offline Documents: CRA COULD ILLUSTRATE APPRORIATE DOCUMENTS

Key Criteria Summary

R&D Base demo

1301 - Pump redesign

Benchmarks: Internet searches: 5 Articles
Similar prior in-house technologies: 1 products /
Potential components: 1 products

Objectives: Maximum operating temperature: 250 Deg C
PUMP COST: 500 $

Uncertainty: 1 - CRA illustration of technological uncertainty

Key Variables: seal designs (shapes, thicknesses, angles), seal materials

Activity	Testing Methods	Results - % of Objective	Variables Concluded	Hours	Materials $	Subcontractor $	Fiscal Year
1 - Development	Analysis / simulation: 110 alternatives Process trials: 45 runs / samples Physical prototypes: 3 samples ... prototype revisions: 44 revisions	Maximum operating temperature: 220 Deg C (78 %)	seal materials	0.00	0.00	0.00	2013

1302 Oil seed extraction process

Scientific or Technological Objectives:

Measurement	Current Performance	Objective	Has results?
Extraction temperature (Deg C)	80	50	Yes
COST OF MACHINE ($)	75000	75000	No
RECLAMATION EFFICIENCY (% recovery)	22	70	No
OIL PURITY (%)	95	98	No

The following details are excerpts from the CRA release on Sept 18, 2013 entitled;

"Draft examples to illustrate key concepts in the Eligibility of Work for SR&ED Investment Tax Credits Policy"

Example 2

This example shows that technological uncertainties may arise from limitations in current technology, and technological uncertainty exists when it is not known whether a given result or objective can be achieved or how to achieve it based on generally available scientific or technological knowledge or experience.

Business objectives:

There is a need to develop a low-temperature oil-extraction process, including separating protein-rich flour from seed coats, to produce a protein-rich product suitable for human consumption.

Technology objectives:

The specific technological problem is how to separate the seed coats from the protein flour at low temperature. It is difficult to physically separate seed coats and protein flour because they have very similar physical properties and the protein flour is firmly bonded to the seed coats.

Technology or Knowledge Base Level:

Benchmarking methods & sources for citings:

Benchmark Method/Source	Measurement	Explanatory notes
Internet searches	5 Articles	SHOULD DETAIL WHAT IF ANY INFORMATION WE FOUND ON THE LIMTS OF THE MACERATION PROCESS FOR THIS ENVIRONMENT.
Competitive products or processes	1 products	IF WE CONSIDERED ANY COMPETIVE METHODS THIS SHOULD BE EXPLAINED.
Similar prior in-house technologies	1 products / processes	WE CAN ASSUME THE TECHNOLOGY IS BASED ON PRIOR IN HOUSE DESIGNS BUT THIS IS UNCLEAR.

The current technology of extracting oil from oilseeds is based on a batch process, in which seeds are crushed, conditioned, and flaked.

The residue after removing the oil consists mainly of protein-rich flour and seed coats with some trapped oil. This residue (or meal) is then ground and the remaining trapped oil is extracted with a solvent. The solvent is recovered from both the meal and the extracted oil by toasting and distillation. The meal is generally sold as an animal feed product.

The main limitation of the current technology is that the meal is a mixture of the protein-rich flour and seed coats. Seed coats have no nutritional value, and are visually undesirable as a potential ingredient in foods for human consumption.

Also, the conditioning and flaking at 80-100°C harms the nutritional value of the oil and the flour.

Though there were several technologies available to separate solid particles with different physical properties, no effective low temperature technologies were available to separate solid particles with very similar physical properties where the particles themselves were bonded together.

One technology which had been tried at a small scale was ultrasonic maceration. However, since there was no publicly available information on the use of ultrasonic maceration for this particular type of oilseed, the operating parameters needed to test the technology were not in the public domain.

Field of Science/Technology:

The Field of Science has not been identified.

Project Details:

Intended Results:	Improve existing processes
Work locations:	Commercial Facility
Key Employees:	Isaac Newton (Mechanical engineering - M.Asc. (1974) / Research Manager)
Evidence types:	Progress reports, minutes of project meetings; Test protocols, test data, analysis of test results, conclusions; Photographs and videos; Records of trial runs

Scientific or Technological Advancement:

Uncertainty #1: Scientific & system uncertainty

The specific technological problem is how to separate the seed coats from the protein flour at low temperature.

One technology which had been tried at a small scale was ultrasonic maceration. However, since there was no publicly available information on the use of ultrasonic maceration for this particular type of oilseed, the operating parameters needed to test the technology were not in the public domain.

Also, it was not known whether the continuous process needed on a large scale, including the ultrasonic maceration and simultaneous solvent extraction, could be developed.

There was technological uncertainty in developing a continuous method to process oilseeds at low temperatures because no one knew whether the objective could be achieved and how to achieve it.

** AUTHORS NOTE: EACH OF THESE PARAMETERS WOULD LIKELY HAVE MANY VARIABLES. THESE WOUULD FORM THE BASES OF THE EXPERIMENTATION.

The most significant underlying key variables are: effects of ultrasonic maceration, key operating parameters ** - EXPAND, solvent extraction method **- EXPAND

Activity #1-1: Development (Fiscal Year 2013)

Methods of experimentation:

Method	Experimentation Performed
Analysis / simulation:	154 alternatives
	Examined over 150 simulations based on alternate component combinations
Process trials:	7 runs / samples
	Chose 7 combinations for further testing and determined limits of existing operating line
Physical prototypes:	1 samples (with 17 revisions)
	Built test scale prototype line including 17 revisions.

Results:

- Extraction temperature : 60 Deg C (66% of goal)

Conclusion:

According to the CRA,

> "There was technological uncertainty in developing a continuous method to process oilseeds at low temperatures because no one knew whether the objective could be achieved and how to achieve it."

IN THE AUTHOR'S OPINION THE IDEAL DESCRIPTION WOULD BE SPECIFIC AS TO WHAT WAS LEARNED IN RELATION TO THE "VARIABLES' OF EXPERIMENTATION.

Significant variables addressed: effects of ultrasonic maceration, key operating parameters ** - EXPAND, solvent extraction method **- EXPAND

Documentation:

- Offline Documents: COULD PROVIDE DOCUMENTATION EXAMPLES

1302 - Oil seed extraction process

Benchmarks: Internet searches: 5 Articles
Competitive products or processes: 1 products
Similar prior in-house technologies: 1 products /

Objectives: Extraction temperature : 50 Deg C
COST OF MACHINE: 75000 $
RECLAMATION EFFICIENCY: 70 % recovery
OIL PURITY: 98 %

Uncertainty: 1 - Scientific & system uncertainty

Key Variables: effects of ultrasonic maceration, key operating parameters ** - EXPAND, solvent extraction method **- EXPAND

Activity	Testing Methods	Results - % of Objective	Variables Concluded	Hours	Materials $	Subcontractor $	Fiscal Year
1 - Development	Analysis / simulation: 154 alternatives Process trials: 7 runs / samples Physical prototypes: 1 samples ... prototype revisions: 17 revisions	Extraction temperature : 60 Deg C (66 %)	effects of ultrasonic maceration key operating parameters ** - EXPAND solvent extraction method **- EXPAND	0.00	0.00	0.00	2013

1303 HVAC - How cost constraints affect a project

Scientific or Technological Objectives:

Measurement	Current Performance	Objective	Has results?
Cost ($ / unit)	300	200	Yes
Minimum conversion temperature (Deg C)	35	20	Yes

Example 3 – Illustrating concepts from paragraph 5, section 2.1.1 Eligibility of Work for SR&ED Investment Tax Credits Policy

According to the CRA, This example shows that cost targets are not technological uncertainties, but a technological uncertainty may arise by trying technologically uncertain paths to solve a problem to meet the cost targets.

A company wants to develop an air recirculation system for energy-efficient homes that will permanently remove carbon monoxide. A key component of this system is a module in which carbon monoxide (CO) is converted to relatively harmless carbon dioxide (CO2) at room temperature.

Technology or Knowledge Base Level:

No benchmarks have been identified.
A process is available that uses a tin oxide and platinum catalyst to convert CO to CO2 at room temperature, and the company could develop a product based on this process. However, the high cost of using this process will make the selling price of the product out of reach for consumers.

There are other methods to convert carbon monoxide, but they are not effective at room temperature. A key requirement is that the module must operate at room temperature.

Field of Science/Technology:

Mechanical engineering (2.03.01)

Project Details:

Intended Results:	Improve existing processes
Work locations:	Research Facility
Key Employees:	Nick Tesla (Electrical technology - CET (2002) / Research Associate)
Evidence types:	None.

Scientific or Technological Advancement:

Uncertainty #1: Convert CO to CO2 at room temp

To achieve the project objective (a room-temperature carbon monoxide remover), the company has to develop an inexpensive process that operates effectively at room temperature.

The technological uncertainty relates to how to convert CO to CO2 at room temperature that does not use the costly process with tin oxide and platinum.

The most significant underlying key variables are: how to convert CO to CO2 at room temp

Activity #1-1: Development (Fiscal Year 2013)

Methods of experimentation:

Method	Experimentation Performed
Analysis / simulation:	25 alternatives
Process trials:	7 runs / samples

AUTHOR'S NOTE: THE EXAMPLE DID NOT PROVIDE ANY DETAILS OF EXPERIMENTATION.

Results:

- Cost: 180 $ / unit (120% of goal)
- Minimum conversion temperature: 23 Deg C (80% of goal)

Conclusion:

According to the CRA:

> "Although the cost target by itself is not a technological uncertainty, a technological uncertainty may arise from the need to avoid using a costly process, even though that process is known to work. The required cost target is also the motivation or reason for the company to undertake work to remove this uncertainty."

IN THE AUTHORS OPINION THIS ILLUSTRATES HOW

- THE QUANTIFIABLE BUSINESS OBJECTIVES (IN THIS CASE TO REDUCE COST WHILE MAINTAINING OTHER PERFORMANCE PARAMETERS)

- "STACK UP" TO CREATE "TECHNOLOGICAL UNCERTAINTY."

Significant variables addressed: how to convert CO to CO2 at room temp

1303 - HVAC - How cost contraints affect a project

Benchmarks: (none)

Objectives: Cost: 200 $ / unit
Minimum conversion temperature: 20 Deg C

Uncertainty: 1 - Convert CO to CO2 at room temp

Key Variables: how to convert CO to CO2 at room temp

Activity	Testing Methods	Results - % of Objective	Variables Concluded	Hours	Materials $	Subcontractor $	Fiscal Year
1 - Development	Analysis / simulation: 25 alternatives	Cost: 180 $ / unit (120 %) Minimum conversion temperature: 23 Deg C (80 %)	how to convert CO to CO2 at room temp	0.00	0.00	0.00	2013

1304 Greenhouse management strategy - INELIGIBLE

Scientific or Technological Objectives:

Measurement	Current Performance	Objective	Has results?
YIELD / ACRE (KG)	100	120	No

After testing a newly developed plant variety, a greenhouse grower feels that there is a chance for commercial success and attempts to find the optimum conditions to maximize production.

Depending on the zone size that can be controlled in the greenhouse, anywhere from 2 to 10 acres is planted with the promising variety.

Technology or Knowledge Base Level:

Benchmarking methods & sources for citings:

Benchmark Method/Source	Measurement	Explanatory notes
Internet searches	1 Articles	
Patent searches	1 patents	
Competitive products or processes	1 products	
Similar prior in-house technologies	1 products / processes	
Potential components	1 products	
Queries to experts	1 responses	

AUTHOR'S NOTE:

THIS EXAMPLE IS BASED ON THE ASSUMPTION THE DEVELOPMENT OF GREENHOUSE MANAGEMENT STRATEGIES IS ALWAYS ROUTINE & THAT ALL WORK CAN BE RESOLVED THROUGH THE USE OF EXISTING MODELS.

IN THE AUTHOR'S OPINION THE CLAIMANT SHOULD BE:

- GIVEN THE OPPORTUNITY TO BENCHMARK THE AVAILABLE MANAGEMENT MODELS &
- IF THEY CAN PROVE THEY ARE ADVANCING THESE MODELS

THE WORK MIGHT BE ELIGIBLE.

Field of Science/Technology:

Plant breeding & plant protection (4.01.08)

Project Details:

Intended Results:	Improve existing processes
Work locations:	Commercial Facility
Key Employees:	Mark Seed (Biological Science - B.Sc. (1995) / Researcher)
Evidence types:	Progress reports, minutes of project meetings; Samples, prototypes, scrap or other artefacts; Project planning documents; Design of experiments; Records of trial runs

Scientific or Technological Advancement:

Uncertainty #1: Greenhouse optimization

Greenhouse growers are aware of optimization techniques for factors such as lighting, temperature, CO2 and humidity.

Also, developing and implementing management protocols for controlling nutrient levels, de-leafing, thinning, and other operational practices are familiar to them.

The most significant underlying key variables are: light, temperature, CO2, humidity, nutrient levels

Activity #1-1: Crop husbandry development (Fiscal Year 2013)

Methods of experimentation:

No experimentation methods have been recorded for this Activity.

The grower monitors the growth of the crop and, depending on its performance, makes adjustments to guide the crop to optimal production. These adjustments are often called the “development of cultural management strategies or crop husbandry strategies.”

However, greenhouse growers are aware of optimization techniques for factors such as lighting, temperature, CO2 and humidity. Also, developing and implementing management protocols for controlling nutrient levels, de-leafing, thinning, and other operational practices are familiar to them.

Results:

No results have been recorded for this Activity.

Conclusion:

According to the CRA,

"These well-known and practiced techniques are standard in this industry, as growers are reasonably certain that the techniques, data, and procedures, when applied in this case, would work.

So, although the grower may not be certain of the specific parameters, determining them using these approaches is part of the standard practice of this industry.

In this case, there is no scientific or technological uncertainty in determining the optimum conditions to maximize production of a new plant variety."

AS PREVIOULSY STATED, IN THE AUTHOR'S OPINION THE CLAIMANT SHOULD BE:

- GIVEN THE OPPORTUNITY TO BENCHMARK THE AVAILABLE MANAGEMENT MODELS &
- IF THEY CAN PROVE THEY ARE ADVANCING THESE MODELS

THE WORK MIGHT BE ELIGIBLE.

IF THE PARAMETERS CAN BE DETERMINED USING EXISTING PREDICTIVE ALGORITHMS THIS WOULD BE "ROUTINE" HOWEVER, IF THE ALGORITHMS ARE IMPROVED THIS COULD REPRESENT A TECHNOLOGICAL ADVANCEMENT.

THE DANGER OF SUCH EXAMPLE IS THAT ALL WORK IN AGRICULTURAL SCIENCE WILL NOW LIKELY BE DENIED.

Significant variables addressed: CO2, humidity, light, nutrient levels, temperature

Documentation:

- Offline Documents: SAMPLE DOCUMENTS COULD BE PROVIDED

1304 - Greenhouse management strategy - INELIGIBLE

Benchmarks: Internet searches: 1 Articles
Patent searches: 1 patents
Competitive products or processes: 1 products
Similar prior in-house technologies: 1 products /
Potential components: 1 products
Queries to experts: 1 responses

Objectives: YIELD / ACRE: 120 KG

Uncertainty: 1 - Greenhouse optimization

Key Variables: CO2, humidity, light, nutrient levels, temperature

Activity	Testing Methods	Results - % of Objective	Variables Concluded	Hours	Materials $	Subcontractor $	Fiscal Year
1 - Crop husbandry	(none)	(none)	CO2 humidity light nutrient levels temperature	0.00	0.00	0.00	2013

1305 Glue development - Hypotheses formulation example

Scientific or Technological Objectives:

Measurement	Current Performance	Objective	Has results?
BOND STRENGTH (KG)	500	600	Yes
COST / LITRE ($)	30	30	Yes

The research and development (R&D) department of a company was asked to come up with a solution to improve the bond strength of their premier glue product to compete with another product.

Technology or Knowledge Base Level:

Benchmarking methods & sources for citings:

Benchmark Method/Source	Measurement	Explanatory notes
Internet searches	5 Articles	
Competitive products or processes	1 products	
Similar prior in-house technologies	5 products / processes	

The R&D chemist who was assigned to the project recently came across a published research paper whose authors had used an additive (acting as bonding agent) to increase the bonding strength of two chemicals that belong to the same class of materials as used in the company's premier glue product.

However, the conditions (temperature, pressure, humidity) under which the authors used the additive were quite different than those used by the company in manufacturing the glue. The chemist carried out further searches in both scientific and technical publications on the use of this additive but found nothing more.

There was no way of predicting whether the additive would work in enhancing the bond strength of the glue considering the conditions under which the glue was manufactured.

Field of Science/Technology:

Physical chemistry, polymer science & plastics (1.04.03)

Project Details:

Intended Results:	Improve existing processes
Work locations:	Lab
Key Employees:	Al Nobel (Chemical Engineering - P.Eng. (1989) / Research Associate)
Evidence types:	None.

Scientific or Technological Advancement:

Uncertainty #1: Additive effects & formulation

The chemist hypothesized that, based on the similarity of the chemical properties of the glue ingredients and the two chemicals used in the research paper, the use of the new bonding agent in the manufacture of the glue under the right conditions should increase the bond strength of the glue.

The most significant underlying key variables are: temperature, pressure, humidity, additive - amounts, timing (unresolved)

Activity #1-1: Development (Fiscal Year 2013)

Methods of experimentation:

Method	Experimentation Performed
Analysis / simulation:	25 alternatives
Process trials:	12 runs / samples

Results:

- BOND STRENGTH: 650 KG (150% of goal)
- COST / LITRE: 30 $ (100% of goal)

Conclusion:

According to the CRA

> "This example simply illustrates the concept of a hypothesis—an idea, consistent with known facts, that serves as a starting point for further investigation to prove or disprove that idea."

AUTHOR'S NOTE:

> THIS PROJECT PROVIDES AN EXCELLENT OPPORTUNITY FOR THE CRA TO PROVIDE AN EXAMPLE OF A COMPLETE PROJECT DESCRIPTION.
>
> THIS IN TURN COULD FURTHER ILUSTRATE THE "INTER-RELATIONSHIP" OF THE ELIGIBLITY CRITERIA.

Significant variables addressed: humidity, pressure, temperature

1305 - Glue development - Hypotheses formulation example

Benchmarks: Internet searches: 5 Articles
Competitive products or processes: 1 products
Similar prior in-house technologies: 5 products /

Objectives: BOND STRENGTH: 600 KG
COST / LITRE: 30 $

Uncertainty: 1 - Additive effects & formulation

Key Variables: additive - amounts, timing, humidity, pressure, temperature

Activity	Testing Methods	Results - % of Objective	Variables Concluded	Hours	Materials $	Subcontractor $	Fiscal Year
1 - Development	Analysis / simulation: 25 alternatives	BOND STRENGTH: 650 KG (150 %) COST / LITRE: 30 $ (100	humidity pressure temperature	0.00	0.00	0.00	2013

1306 Food development - INELIGIBLE TRIAL & ERROR

Scientific or Technological Objectives:

No objectives have been identified.
Example 6 – Illustrating concepts from paragraph 7, section 2.1.3 Eligibility of Work for SR&ED Investment Tax Credits Policy

This example shows that when a series of tests are executed without any systematic plan and no attempt is made to analyze the results from each test, it is considered trial and error. Such work is not scientific research and experimental development (SR&ED).

A company that has been involved in preparing food products for several years wanted to develop a low-calorie pocket pizza product.

They proceeded by attempting to create the low-calorie pizza based on their knowledge of preparing standard pizza products.

Technology or Knowledge Base Level:

No benchmarks have been identified.

Field of Science/Technology:

Food and beverages (2.11.01)

Project Details:

Intended Results:	Improve existing materials, devices, or products
Work locations:	Commercial Facility
Key Employees:	Lou Pasteur (Chemistry - BSc. (1996) / Research Associate)
Evidence types:	None.

Scientific or Technological Advancement:

Uncertainty #1: Business vs. technological uncertainty

AUTHORS' NOTE:

IN THE EXAMPLE THE CLAIMANT DID NOT APPEAR TO QUANTIFY OR MEASURE ANY OF THESE VARIABLES DURING THE DEVELOPMENT PROCESS.

The most significant underlying key variables are:

ingredient selection, order of ingredients, size / shape of ingredients

Activity #1-1: Trial & error development process (Fiscal Year 2013)

Methods of experimentation:

Method	Experimentation Performed
Process trials:	4 runs / samples

In their first attempt, they used different amounts of sauce, reduced the amount of cheese, and replaced the regular pepperoni with low-fat turkey pepperoni, without changing the layer structure of the pizza. This attempt was considered a failure because the low-fat pepperoni burned during cooking.

The next series of attempts involved preparing and testing a different order of layering the ingredients. This attempt also failed because the large size of the pieces of pepperoni led to undercooking.

The third attempt reduced the size of the pepperoni pieces by half. This attempt was somewhat successful, but still not good enough.

The fourth attempt reduced the thickness of the low-fat pepperoni pieces. This fourth attempt was considered a success and the company proceeded to commercialize the product.

Results:

No results have been recorded for this Activity.

AUTHOR'S NOTE:

SINCE THE CLAIMANT DID NOT PROVIDE QUANTIFIABLE OBJECTIVES WE CANNOT QUANTIFY THE RESULTS OF THE WORK.

AS A RESULT IF BECOMES HARD TO ILLSUTRATE THE "EXTREMELY ACCURATE MEASUREMENTS" WHICH THE TAX COURT OF CANADA REQUIRES EVIDENCE OF.

Conclusion:

According to the CRA,

"The only lesson learned from each attempt was that it failed. There was no work at any stage to analyze the results from each trial and take corrective action based on the results.

In other words, there was no planned approach, including identifying a technological uncertainty, formulating a hypothesis to eliminate that uncertainty, testing the hypothesis, analyzing the results to draw conclusions, and carrying out more experimentation, if needed.

The work described in this example is trial and error."

IN THE AUTHOR'S VIEW THIS PROJECT COULD BE FURTHER DEVELOPED TO ILLUSTRATE:

1) A "WHAT IF" SCENARIO ON HOW THE WORK MIGHT BE ELIGIBLE &

2) THE TYPE OF DOCUMENTATION WHICH WOULD BE EXPECTED.

Significant variables addressed: ingredient selection, order of ingredients, size / shape of ingredients

1306 - Food development - INELIGIBLE TRIAL & ERROR

Benchmarks: (none) **Objectives:** (none)

Uncertainty: 1 - Business vs. technological uncertainty **Key Variables:** ingredient selection, order of ingredients, size / shape of ingredients

Activity	Testing Methods	Results - % of Objective	Variables Concluded	Hours	Materials $	Subcontractor $	Fiscal Year
1 - Trial & error development process	Process trials: 4 runs / samples	(none)	ingredient selection order of ingredients size / shape of	0.00	0.00	0.00	2013

1307 Potato peeler - WHAT IF SCENARIOS

Scientific or Technological Objectives:

Measurement	Current Performance	Objective	Has results?
Dishwasher safe (# cycles)	1000	1200	Yes
COST ($/UNIT)	2	1.5	Yes
Profile roughness (Rp) (micro inches)	2	1	Yes
Area Roughness (Ra) (micro inches)	2	1.5	Yes

Example 7 – Illustrating concepts from paragraph 4, section 2.1.4 Eligibility of Work for SR&ED Investment Tax Credits Policy

According to the CRA:

> "The following example shows how creating new materials, devices, products, or processes, or improving existing ones, can be achieved with or without technological advancement"

Case 1

> The basic design of the potato peeler has not changed for more than 100 years. A company decided to develop a novel peeler by adding a phosphorescent substance to the plastic handle so that it would be easier to find in a dark kitchen drawer.

Case 2

> The same company wanted to develop a new potato peeler with the same blade but wanted to modify the handle to make it easier to use.
>
> The new handle would be larger, easier to grip, and less likely to slip in the hand of the user. This would be achieved by making it softer yet rigid enough to retain its shape, and its surface would have to be rough enough to prevent it from slipping in a wet hand. It would also have to be dishwasher safe.

Technology or Knowledge Base Level:

Benchmarking methods & sources for citings:

Benchmark Method/Source	Measurement	Explanatory notes
Competitive products or processes	5 products	
Similar prior in-house technologies	3 products / processes	
Potential components	12 products	EXAMINED 12 DIFFERENT PLASTICS

Field of Science/Technology:

Mechanical engineering (2.03.01)

Project Details:

Intended Results:	Improve existing processes
Work locations:	Commercial Facility
Key Employees:	Al Nobel (Chemical Engineering - P.Eng. (1989) / Research Associate)
Evidence types:	None.

Scientific or Technological Advancement:

Uncertainty #1: Technological uncertainty- Case 2

In developing the new handle, they encountered difficulties in the injection molding process.

The company found that the working temperature for the new polymer had to be much higher than what the current molding process was designed to operate at.

AUTHOR'S NOTE: AN IDEAL EXAMPLE WOULD FURTHER ILLUSTRATE THE VARIABLES OF UNCERTAINTY.

The most significant underlying key variables are: optimal polymer material, working temperature, adaption of injection molding process

Activity #1-1: Case 1 - INELIGIBLE (Fiscal Year 2013)

Methods of experimentation:

No experimentation methods have been recorded for this Activity.
There was no change to the shape of the handle or to the blade.

Adding the phosphorescent substance did not entail any change to the molding process and did not affect the physical properties of the handle or the performance of the peeler.

Results:

No results have been recorded for this Activity.

Conclusion:

While this was a new product, there was no technological advancement in creating this “glow-in-the-dark” peeler.

Activity #1-2: Case 2 - ELIGIBLE (Fiscal Year 2013)

Methods of experimentation:

Method	Experimentation Performed
Analysis / simulation:	47 alternatives
Process trials:	11 runs / samples
Physical prototypes:	1 samples (with 4 revisions)

The company found that their requirements could not be satisfied with any plastic that was available at the time. They decided to try to use a new polymer.

In developing the new handle, they encountered difficulties in the injection molding process. Using the new polymer in their existing molding process did not produce a handle with the desired physical properties.

The company found that the working temperature for the new polymer had to be much higher than what the current molding process was designed to operate at.

Eventually, a new injection molding process had to be developed that used the new polymer to produce the product that had the desired physical properties.

Results:

- Dishwasher safe: 1200 # cycles (100% of goal)
- COST: 1.3 $/UNIT (140% of goal)
- Profile roughness (Rp): 2 micro inches (no improvement)
- Area Roughness (Ra): 1.4 micro inches (120% of goal)

Conclusion:

According to the CRA;

"The acquired know-how to develop the new injection molding process represented a technological advancement for the company."

AUTHOR'S NOTE:

THE IDEAL DESCRIPTION COULD ILLSUTRATE:

- ADDITIONAL WORK ON THE DEVELOPMENT OF THE INJECTION MOLDING PROCESS &
- CLARIFYING WHAT WAS LEARNED REGARDING THE VARIABLES OF EXPERIMENTATION.

Significant variables addressed: adaption of injection molding process, optimal polymer material, working temperature

1307 - Potato peeler - WHAT IF SCENARIOS

Benchmarks: Competitive products or processes: 5 products
Similar prior in-house technologies: 3 products /
Potential components: 12 products

Objectives: Dishwasher safe: 1200 # cycles
COST: 1.5 $/UNIT
Profile roughness (Rp): 1 micro inches
Area Roughness (Ra): 1.5 micro inches

Uncertainty: 1 - Technological uncertainty- Case 2

Key Variables: adaption of injection molding process, optimal polymer material, working temperature

Activity	Testing Methods	Results - % of Objective	Variables Concluded	Hours	Materials $	Subcontractor $	Fiscal Year
1 - Case 1 - INELIGIBLE	(none)	(none)	(none)	0.00	0.00	0.00	2013
2 - Case 2 - ELIGIBLE	Analysis / simulation: 47 alternatives Process trials: 11 runs / samples Physical prototypes: 1 samples ... prototype revisions: 4 revisions	Dishwasher safe: 1200 # cycles (100 %) COST: 1.3 $/UNIT (140 %) Profile roughness (Rp): 2 micro inches (0 %) Area Roughness (Ra): 1.4 micro inches (120 %)	adaption of injection molding process optimal polymer material working temperature	0.00	0.00	0.00	2013

1308 Hockey stick design - SAMPLE SIZE

Scientific or Technological Objectives:

Measurement	Current Performance	Objective	Has results?
TOLERANCE (mm)	0.3	0.3	Yes
PRODUCTION RATE (units / minute)	2	3.5	Yes
REJECT RATE (%)	2	1	Yes

Example 8 – Illustrating concepts from paragraph 2, section 2.2.1 Eligibility of Work for SR&ED Investment Tax Credits Policy

> The following example illustrates the concept that only the amount, size, extent, or duration of work that is necessary for and directly in support of the basic research, applied research, or experimental development work undertaken in Canada is eligible.

The company started a project involving experimental development work to integrate an advanced scanning and laser cutting technology to cut and rasp hockey sticks in a single machine.

Technology or Knowledge Base Level:

Benchmarking methods & sources for citings:

Benchmark Method/Source	Measurement	Explanatory notes
Internet searches	5 Articles	
Similar prior in-house technologies	1 products / processes	

A company produces field-hockey sticks in large numbers to supply the world market. The production stage of the sticks mainly consists of a machine that accepts pre-cut lengths of timber and produces the cut forms for further processing.

AUTHOR'S NOTE: THE CLAIMANT SHOULD DETAIL ALL SOURCES THEY USED TO DEFINE STANDARD PRACTICE.

Field of Science/Technology:

Mechanical engineering (2.03.01)

Project Details:

Intended Results:	Improve existing processes
Work locations:	Commercial Facility
Key Employees:	Al Nobel (Chemical Engineering - P.Eng. (1989) / Research Associate)
Evidence types:	None.

Scientific or Technological Advancement:

Uncertainty #1: Design

AUTHOR'S NOTE: THE CURRENT EXAMPLE IS UNCLEAR AS TO THE;

- VARIABLES OF UNCERTAINTY
- WHICH FORM THE BASIS OF THE EXPERIMENTATION.

The most significant underlying key variables are: TYPE OF SCAN (unresolved), LASER POSITION (unresolved)

Activity #1-1: Design - e

Methods of experimentation:

Method	Experimentation Performed
Process trials:	2000 runs / samples

Based on statistical analysis and their in-house knowledge of the existing machinery, the company determined that 500 sticks from the cutting and rasping machine would generate sufficient out-of-tolerance sticks to test and validate, with 95% confidence, that the development could be considered complete and successful.

The company, on receiving a large order, produced 2,000 sticks.

Results:

- TOLERANCE: 0.3 mm (100% of goal)
- PRODUCTION RATE: 4 units / minute (133% of goal)
- REJECT RATE: 2 % (no improvement)

Conclusion:

According to the CRA;

> "In this case, the testing and data collection associated with cutting and rasping the first 500 sticks is commensurate with the needs and directly in support of the SR&ED work."

IN THE AUTHOR'S OPINION THIS PROVIDES THE OPPORTUNITY TO FURTHER ILLUSTRATE KEY ISSUES SUCH AS;

- ACCEPTABLE METHODS ON HOW TO DETERMINE SAMPLE SIZES &
- WHAT IF THE 500 PROTOTYPE STICKS WERE SOLD?

1308 - Hockey stick design - SAMPLE SIZE

Benchmarks: Internet searches: 5 Articles
Similar prior in-house technologies: 1 products /

Objectives: TOLERANCE: 0.3 mm
PRODUCTION RATE: 3.5 units / minute
REJECT RATE: 1 %

Uncertainty: 1 - Design

Key Variables: LASER POSITION, TYPE OF SCAN

Activity	Testing Methods	Results - % of Objective	Variables Concluded	Hours	Materials $	Subcontractor $	Fiscal Year
1 - Design - eligible test size	Process trials: 2000 runs / samples	TOLERANCE: 0.3 mm (100 %) PRODUCTION RATE: 4 units / minute (133 %) REJECT RATE: 2 % (0 %)	(none)	0.00	0.00	0.00	2013

1309 Chemical formulation - DATA COLLECTION SCENARIOS

Scientific or Technological Objectives:

No objectives have been identified.

Example 9 – Illustrating concepts from paragraph 4, section 2.2.2 Eligibility of Work for SR&ED Investment Tax Credits Policy

This example shows that it is the purpose of the work, rather than the nature of the work, that distinguishes support work from excluded work.

Example

In a chemical plant, one of the daily duties of a lab technologist is to take samples from various points throughout the process, perform various analytical tests, and then enter the results into the plant's database.

This database is used by many facets of the organization to monitor, optimize, and control the process.

Technology or Knowledge Base Level:

Benchmarking methods & sources for citings:

Benchmark Method/Source	Measurement	Explanatory notes
Similar prior in-house technologies	1 products / processes	CLAIMANT IS USING THEIR EXISTING DATABASE(S)

IDEALLY THEY WOULD ALSO ILLUSTRATE ANY OTHER SEARCHES FOR INFORMATION WHICH MIGHT BE

- "READILY AVAILABLE" TO
- SOMEONE SKILLED IN THE ART.

FAILURE TO DETAIL THIS "DUE DILIGENCE" IS A MAJOR WEAKNESS IN UNSUCCESSFUL CLAIMS.

Field of Science/Technology:

Physical chemistry, polymer science & plastics (1.04.03)

Project Details:

Intended Results:	Improve existing processes
Work locations:	Lab
Key Employees:	Al Nobel (Chemical Engineering - P.Eng. (1989) / Research Associate)
Evidence types:	None.

Scientific or Technological Advancement:

Uncertainty #1: Technological Uncertainty

No description has been provided for this Uncertainty.

Activity #1-1: Case 1 -INELIGIBLE (Fiscal Year 2013)

Methods of experimentation:

No experimentation methods have been recorded for this Activity.

A research chemist for the company accesses the plant database and uses the data in a research project (assume that this is an SR&ED project).

Although the data collected and entered into the plant database is useful to (and used for) an SR&ED project, the data collection and testing performed by the lab technologist are done routinely and not specifically for the SR&ED work.

In this case, the daily data collection and testing are considered routine data collection and routine testing and cannot be claimed as part of the SR&ED project.

Results:

No results have been recorded for this Activity.

Conclusion:

According to the CRA,

"This example shows how the same type of work—collecting and analyzing samples in a commercial process—may or may not be SR&ED work depending on the purpose of the work being done."

AUTHOR'S NOTE: IN THIS CASE THE DATA WAS COLLECTED BEFORE THE TECHNOLOGICAL UNCERTAINTY WAS DEFINED.

Activity #1-2: Case 2 - ELIGIBLE (Fiscal Year 2013)

Methods of experimentation:

No experimentation methods have been recorded for this Activity.

A research chemist is carrying out an SR&ED project. Much of the data being used again comes from the plant database.

Here, however, the researcher also asks the lab technologist to collect specific samples and run specified tests over and above the work that the technologist routinely performs on a daily basis.

For this particular research work, the chemist uses both the data and the results from the daily work of the technologist, as well as the specific work he requested from the lab technologist.

Results:

No results have been recorded for this Activity.

Conclusion:

According to the CRA,

> "In the context of SR&ED, the data collection and testing that the technologist carries out specifically for the chemist's research project are directly in support of SR&ED. However, the data collection and testing the technologist performs on a daily basis, as in case 1, are routine data collection and routine testing and are excluded from the SR&ED project."

AUTHOR'S NOTE: IN THIS CASE THE DATA WAS COLLECTED AFTER THE TECHNOLOGICAL UNCERTAINTY WAS DEFINED.

1309 - Chemical formulation - DATA COLLECTION WHAT IF SCENARIOS

Benchmarks: Similar prior in-house technologies: 1 products / **Objectives:** (none)

Uncertainty: 1 - Technological Uncertainty **Key Variables:** (none)

Activity	Testing Methods	Results - % of Objective	Variables Concluded	Hours	Materials $	Subcontractor $	Fiscal Year
1 - Case 1 -INELIGIBLE	(none)	(none)	(none)	0.00	0.00	0.00	2013
2 - Case 2 - ELIGIBLE	(none)	(none)	(none)	0.00	0.00	0.00	2013

1310 Electronics – SR&ED vs. business portion of the project

Scientific or Technological Objectives:

Measurement	Current Performance	Objective	Has results?
Component size (cm 2)	30	25	Yes

A company wanted to develop an improved electronic product by incorporating a specific component that would add a new functionality.

The company prepared a project plan including budget, created a new cost centre, and allocated staff to work on the project.

The company then proceeded with the technological feasibility study, preparing the technical specifications, designing, building the prototype, testing, and making the final incorporation of the component into the product before starting the commercial production, marketing, and sales.

In this case, the company project encompasses all the activities from initial idea to final product launch.

Technology or Knowledge Base Level:

Benchmarking methods & sources for citings:

Benchmark Method/Source	Measurement	Explanatory notes
Similar prior in-house technologies	1 products / processes	
Queries to experts	1 responses	

During development, a problem arose with the size of the new component in relation to the size of the existing product.

Knowledge of miniaturization in the field of microelectronics was required to fit the new component into the existing product. The company did not possess that knowledge. As a result, the company contracted out the miniaturization work.

Field of Science/Technology:

Electrical and electronic engineering (2.02.01)

Project Details:

Intended Results:	Improve existing materials, devices, or products
Work locations:	Research Facility
Key Employees:	Nick Tesla (Electrical technology - CET (2002) / Research Associate)
Evidence types:	None.

Scientific or Technological Advancement:

Uncertainty #1: miniaturization

No description has been provided for this Uncertainty.

Activity #1-1: Mininaturization design (Fiscal Year 2013)

Methods of experimentation:

Method	Experimentation Performed
Physical prototypes:	5 samples (with 28 revisions)

The contractor performed SR&ED work on behalf of the company.

The work succeeded in reducing the size of the specific component so that it would fit into the current product.

Once the specific component was successfully developed, it was incorporated into the existing product without any difficulty and the rest of the development was accomplished by standard practice.

AUTHOR'S NOTE:

AS WRITTEN IT WOULD APPEAR THAT THE WORK WAS ROUTINE FOR THE SUBCONTRACTOR. IN OTHER WORDS THERE IS NO EVIDENCE OF ANY HYPOTHESES OR EXPERIMENTS. AS A RESULT IT IS UNCLEAR WHY THIS WORK WOULD QUALIFY.

Results:

- Component size: 21 cm 2 (180% of goal)

Conclusion:

According to the CRA,

"In this example, the SR&ED project encompasses the work done to miniaturize the specific component, which is a subset of the overall company project."

AUTHOR'S NOTE: IDEALLY THE PROJECT DESCRIPTION WOULD GET DETAILS FROM THE SUBCONTRACTOR AS TO HOW THIS WORK WOULD QUALIFY.

IN THE CURRENT EXAMPLE IT IS POSSIBLE THAT THE SOLUTION WAS "ROUTINE" FOR THE SUBCONTRACTOR WHO IS A SPECIALIST IN ELECTRONICS.

THIS IS A WEAKNESS OF MANY SR&ED CLAIMS USING SUBCONTRACTORS SINCE THEY TYPICALLY REPORT RESULTS INSTEAD OF CONCLUSIONS. AN IDEAL CLAIM WOULD;

- INVOLVE THE SUBCONTRACTOR TO
- DEFINE THE RELEVANT PROJECT PARAMETERS
- AT AN EARLY STAGE OF THE PROJECT &
- KEEP RELATED DOCUMENTATION.

1310 - Electronics - defining SR&ED portion of total project

Benchmarks: Similar prior in-house technologies: 1 products / Queries to experts: 1 responses

Objectives: Component size: 25 cm 2

Uncertainty: 1 - miniaturization

Key Variables: (none)

Activity	Testing Methods	Results - % of Objective	Variables Concluded	Hours	Materials $	Subcontractor $	Fiscal Year
1 - Mininaturization design	Physical prototypes: 5 samples ... prototype revisions: 28 revisions	Component size: 21 cm 2 (180 %)	(none)	0.00	0.00	0.00	2013

Notable quote

"If GM had kept up with technology like the computer industry has, we would all be driving $25 cars that got 1000 MPG."

- Bill Gates

Recommend details for SR&ED timesheet templates

Project details	
#	Name

FISCAL YEAR ENDED:	

Employee Man-Hours & Cost Summary

Employee details			Linking work to SR&ED				SR&ED wages	
First Name	Last Name	Hours Worked	Type of work Drop down	Variables of research (If possible link work to "Variables" of uncertainty)	Comments	location of work	hourly $ rate	SR&ED $
			1) Design 2) Testing 3) Programming 4) Supervision	*OPTIONAL - Link to the variables in the project*	*OPTIONAL - should be completed by the more senior people if possible.*			
NEED TOTALS BY STATE / PROVINCE								$ -

T - Form T661 - Prescribed Form for SR&ED Expenditures

- Part 1: General Information
  - includes choice of proxy or traditional method
- Part 2 - Scientific or Technological Project Information
  - Step 1: Detailed Project Description
  - Step 2: Project Summary Information
- Part 3: Summary of SR&ED Expenditures
  - Step 1: Allowable SR&ED expenditures for SR&ED carried out in Canada
  - Step 2: Pool of deductible SR&ED expenditures
  - Step 3: Qualified SR&ED expenditures for ITC purposes
- Part 4: Background information (includes statistical information)

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T - Form T661 - Prescribed Form for SR&ED Expenditures

- Schedule A: Third Party Payments
- Schedule B: Special Situations
  - Adjustments to SR&ED expenditure pool
  - Adjustments to Qualified Expenditures
- Schedule C: Non-Arm's-Length Transactions
- Schedule D: Calculation of the Salary Base and the Prescribed Proxy Amount
- Schedule E: List of all SR&ED projects claimed
- Schedule F: Expenditures for SR&ED contracts

Participant question:

- I have a question in relation to conducting SR&ED in "regulated" industries. IC 86-4R3 comments on SR&ED work this area in Sections 7.4 and 7.5 including Note 1 . It is stated that "...studies carried out in these situations are eligible activities because we assume that a S/T U must be resolved.... to the satisfaction of the authorities" - i.e. TU and TA are implicit hence the requirement for certification testing prior to being approved for sale.

  In a recent review situation, we were advised by both the STA and the FR that this wording has been omitted from the on-line version of the policy and hence the policy has been changed and on that basis denied the claim.

  On the other hand, the Dec 19, 2012 policy documents state the opposite - i.e. that the basic policies and principles previously expressed in the various AP's, IC's and Guidance documents have not changed.

  How do we get the STA's to follow CRA policies?

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Notable quote

“Leaders don't create followers, they create more leaders.”

- Tom Peters

IV) OTHER NEW ISSUES - Complete claims & filing deadline – 15/18 months

CRA – prior position (on claims filed within 15 months of year end)

> If an SR&ED claim is filed within **90 days before** the reporting deadline, the CRA should have sufficient time to conduct a review to determine whether or not the claim meets the filing requirements and to advise the claimant of any deficiencies in the claim.

The new Dec. 2012 policy paper reads,

> "If the forms are reviewed by the CRA before the SR&ED reporting deadline, the CRA will advise the claimant of any deficiencies and the claimant will be allowed, up to the SR&ED reporting deadline, to provide any missing information."

IV) OTHER NEW ISSUES - Complete claims & filing deadline – 15/18 months

The new policy paper adds to the list of “prescribed forms” to include:

Prescribed forms for SR&ED expenditures

- Forms T661 & Schedule T2SCH31 are the prescribed forms for
- SR&ED expenditures & tax credits respectively.

Prescribed information for SR&ED forms include

- Form T661, including, if applicable, forms
  - - T1145 (non-arm’s length costs),
  - - T1146 (non-arm’s length credits),
  - - T1174 (specified employees / assoc. co’s), &
  - - T1263 (third party payments)
- Schedule T2SCH31,
  - - Schedule T2SCH49 (exp. limit assoc. co’s).

IV) OTHER NEW ISSUES - Complete claims & filing deadline – 15/18 months

Author's comment

- There is no longer any mention of what might happen if the CRA identifies deficiencies beyond the 90 day limit.

- In the authors opinion the risk of omitting a related schedule is very high and poses a major concern to claimants & preparers alike.

Complete claims & filing deadline

CRA – prior position (on claims filed within 15 months of year end)

Question:

> **When does an SR&ED claim need to be filed** in order for the CRA to review and **advise the claimant of any deficiencies** in the SR&ED claim?

CRA Response:

> If an SR&ED claim is filed **within 90 days before the reporting deadline,** the CRA should have sufficient time to conduct a review to determine whether or not the claim meets the filing requirements and to advise the claimant of any deficiencies in the claim.[11]

The **new Dec. 2012 policy paper** reads,

> "If the forms are reviewed by the CRA before the SR&ED reporting deadline, the CRA will advise the claimant of any deficiencies and the claimant will be allowed, up to the SR&ED reporting deadline, to provide any missing information."[12]

Noticeable this new policy paper also adds to the list of "prescribed forms" to include the following:

Prescribed information & forms

> "Prescribed information is the information to be provided on a form or the manner of filing a form as authorized by the Minister of National Revenue."

Prescribed forms for SR&ED expenditures

> **Forms T661 & Schedule T2SCH31** are the prescribed forms for SR&ED expenditures & tax credits respectively.

Prescribed information for SR&ED forms

> Prescribed information **will also include any attachments or schedules necessary** to provide the information requested on:
>
> Form T661, including, if applicable, forms
>
> - T1145 (non-arm's length costs),
> - T1146 (non-arm's length credits),
> - T1174 (specified employees / assoc. co's), &
> - T1263 (third party payments)
>
> Schedule T2SCH31,
>
> - Schedule T2SCH49 (exp. limit assoc. co's).

Author's comment

> There is no longer any mention of what might happen if the CRA identifies deficiencies beyond the 90 day limit.
>
> In the authors opinion the **risk of omitting** a related schedule is very high and poses **a major concern** to claimants & preparers alike.

Notable quote:

"Everyone has a photographic memory; some just don't have film"

- Steven Wright

[11] CRA Application Policy SR&ED 2004-02, Filing Requirements for Claiming SR&ED Carried Out in Canada, Question 4, October 5, 2004
[12] CRA SR&ED Filing Requirements Policy, December 19, 2012

IV) OTHER NEW ISSUES - not addressed in new CRA SR&ED policy papers

Entitlement to Exploit

- The CRA's prior directives on this issue stated,

  "…this requirement is considered to be **met in cases** where the taxpayer has the **right to use a patent** that results from the SR&ED project even if the taxpayer is charged a royalty or similar fee for the use of the patent. This requirement is also considered to be met in cases where the taxpayer is **entitled to distribute and market** any product that results from the SR&ED project."

Author's comment

- There is no reference to this issue in the current policy papers & the author has witnessed situations where claimants are now being told they must own all rights in order to claim SR&ED tax credits.

Notable quote

"The best way to predict the future is to invent it."

- Alan Kay

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Questions or feedback

We welcome your questions or feedback on any issues raised in this letter.

We also encourage interested parties to examine:

- past SR&ED newsletters
- SR&ED tax guide [the Guide to RDBASE.NET],
- "RDBASE.NET" online SR&ED tracking software &
- additional tutorials re. eligible SR&ED activities at

www.rdbase.net

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Before implementing decisions based on this information, readers are encouraged to seek professional advice, in order to clarify how any issues discussed herein, may relate to their specific situations.