SR&ED Newsletter
Edition 2013 –2

Recent developments to Scientific Research & Experimental Development (SR&ED) project management & tax credit claims.

Contents

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 (CO_2) 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 CO_2 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 CO_2 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 CO_2 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

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.