Project Name:	National R&D - software & SI (LOSS)	**Start Date:**	2021-01-01
Project Number:	2103	**Completion Date:**	2021-12-31

Project Details:

Scientific or Technological Objectives:

Measurement	Current Performance	Objective	Has results?
deterministic and stateful client-side control. (0 = no 1 = yes)	0	1	Yes
develop pivot output mechanism (0=no 1 = yes)	0	1	Yes
response time (seconds)	10	5	Yes

This project example is based on the Tax Court of Canada judgment for National R&D Inc. v. The Queen (2020 TCC 47).

[1] National Research & Development Inc. (“National”), a Canadian-controlled private corporation, which was incorporated on January 1, 2011, provided consulting services to clients in the areas of engineering, information technology, scientific research and experimental development tax credits and Ontario interactive digital media tax credits.

[2] For the 2011 taxation year the Minister disallowed the claim made by National for the expenses it incurred with respect to the PTS Project, totalling $68,029, claimed as SR&ED expenditures as well as the investment tax credit (“ITC”) of $23,810. [AUTHOR'S NOTE: UNDER $25K INFORMAL LIMIT BUT CLIENT ELECTED FULL PROCEDURE.]

[3] During the 2011 taxation year, the sole shareholder and president of National was Mr. Amit Saini. Mr. Saini was the only witness at the hearing. He was directly involved in the PTS Project as he conducted the activities himself, with the help of a student. Mr. Saini was accepted by the Court as a “litigant expert” (Kaul v. The Queen, 2017 TCC 55, at para. 32).

[4] Mr. Saini obtained a Bachelor of Engineering degree from McMaster University in 2003 and got his professional engineering license in 2007. He also obtained a Master of Business Administration degree (MBA) from Wilfrid Laurier University in 2010, a Certified Management Accounting (CMA) designation in 2011 and a Chartered Professional Accounting (CPA) designation in 2012.

Before founding National, he was employed by Meyers Norris Penny from April 2010 to March 2011 as a SR&ED manager. From July 2006 to April 2010, he was employed by ATS Automation Tooling Systems as a senior SR&ED specialist.

Prior to that (2006), he had worked as a manufacturing engineer and product manager at Precision Resource Inc. and in these capacities he was responsible for identifying and tracking SR&ED projects, and he had developed a web-based inventory system using ASP and SQL Server 2000.

OBJECTIVES:

[22] The first phase of the PTS Project, which was carried out during the 2011 taxation year, involved establishing an efficient and concise time-tracking system, and it had three sub-objectives (hereinafter collectively referred to as the “Objectives”):
1. To develop techniques for record set paging, sorting, and indexing that were compatible with the MTA (“Objective 1”);
2. To develop a mechanism for in-memory array initialization of joint record sets such as “pivot-like output” (“Objective 2”); and
3. To develop methods for deterministic and stateful client-side control (“Objective 3”).

Field of Science/Technology:

Computer sciences (1.02.01)

Project Details:

Intended Results:	Develop new materials, devices, or products
Work locations:	Commercial Facility
Key Employees:	Amit Saini (Mechanical - BEng, PEng. (2003) / CEO)
Evidence types:	Test protocols, test data, analysis of test results, conclusions; Records of resources allocated to the project, time sheets; Design, system architecture and source code; Project planning documents; Design of experiments

Scientific or Technological Advancement:

Uncertainty #1: paging, sorting & indexing method

[29] Mr. Saini's testimony was clear in that the PTS Project was to be developed through the MTA.

The MTA consisted of ADO, Classic ASP, COM+ and SQL Server 2000. Mr. Saini had determined that SQL Server 2000 would be used for that purpose and not SQL Server 2005. Furthermore, the framework of the PTS Project had to be web-based, cross-platform and cross-browser compatible.

The fact that SQL Server 2005 existed and had a PIVOT command at the time is not relevant for the purpose of determining whether the activities undertaken by National qualify as SR&ED.

[34] As a preliminary step or as the work was progressing, Mr. Saini examined various technical articles, copies of which were adduced in evidence, to determine whether it was possible to achieve the objectives of the PTS Project within the MTA.

[35] In respect of Objective 1, Mr. Saini testified that he conducted internet research and as a result consulted three articles, namely: "Efficiently Paging Through Large Result Sets In SQL Server 2000" (Exhibit A-4, at p. 41), "SQL Server 2000 Paging and Sorting Using ROWCOUNT And SQL_VARIANT" (Exhibit A-4, at p. 46), and "Efficient Paging of Recordsets: SQL Server 2000" (Exhibit A-4, at p. 53).

[36] Mr. Saini testified that solutions described in these articles would not work within the MTA for various reasons.

Some of the methods described did not return results reliably or efficiently. Additionally, one of the methods described only worked in static environments (the environment for the PTS Project needed to be dynamic).

After reviewing the above-mentioned articles, Mr. Saini concluded that there was no existing method that he could use within the MTA that met all of National's criteria.

[39] Mr. Saini testified about the technological uncertainties in the PTS Project and to the fact that no similar program already existed. According to Mr. Saini, the technological uncertainties were as follows:

i) For Objective 1: how to achieve paging, sorting and indexing of large data sets within the MTA with a maximum response time of 5 seconds;

[40] The Minister made assumptions that there were no technological uncertainties in any of the Objectives and that the activities undertaken by National could have been performed by the application of existing well-known information technology techniques.

The most significant underlying key variables are:

MTA limitations of framework, ADO, Classic ASP, COM+ and SQL Server 2000

Technology or Knowledge Base Level:

Benchmarking methods & sources for citings:

Benchmark Method/Source	Measurement	Explanatory notes
Internet searches	3 Articles	[35] In respect of Objective 1, Mr. Saini testified that he conducted internet research and as a result consulted three articles, namely: "Efficiently Paging Through Large Result Sets In SQL Server 2000" (Exhibit A-4, at p. 41), "SQL Server 2000 Paging and Sorting Using ROWCOUNT And SQL_VARIANT" (Exhibit A-4, at p. 46), and "Efficient Paging of Recordsets: SQL Server 2000" (Exhibit A-4, at p. 53).
Competitive products or processes	3 products	[33] Mr. Saini testified .. In 2011, there was no web -based program that would allow for time tracking of SR&ED projects. QuickBooks Online can be used nowadays, but Mr.

		Saini testified that back in 2011 in its infancy functionality limited. Other programs Kashoo & R&D Manager too rudimentary to meet National's needs.

Activity #1-1: techniques for paging, sorting & indexing (Fiscal Year 2021)

Methods of experimentation:

Method	**Experimentation Performed**
Trials:	50 runs / samples

[23] Work was performed under Objective 1 to develop techniques for record set paging, sorting and indexing that were compatible with ADO, Classic ASP, Com+ and Microsoft SQL Server 2000. According to Mr. Saini, it was necessary to efficiently sort through the data, to push it from SQL Server 2000 through the MTA to the browser incrementally and then to display very quickly only data relevant to a particular client. Work undertaken to achieve this objective involved trying to overcome the paging limitations of SQL Server 2000 using "DataGrid" and "GridView" in ASP. Mr. Saini also testified that he tried using the ASP response buffer to incrementally push the data to the browser, but that method did not work. Other techniques that Mr. Saini attempted which were not successful include using "GetRows" in ADO and using temporary tables to achieve pagination. Eventually, the work undertaken resulted in the creation of what Mr. Saini referred to as the "Stitching Mechanism", a piece of code which allowed SQL statements to be constructed dynamically and allowed simple queries which utilized single-column sorting to return results. That technique was further refined and eventually some success on this point was achieved. According to Mr. Saini, the Stitching Mechanism which utilized dynamic SQL was an invention developed by National, but National was only partially successful in attaining the results desired under Objective 1.

ISSUES RELATED TO SUPPORTING DOCUMENTATION:

[50] Various documents were tendered in evidence by Mr. Saini, which, according to him, show that the scientific method was followed in developing the PTS Project. These documents are

the Project Timeline,
the Letter,
a document titled "Trials to Achieve Sorting & Paging With Set Constraints" (Exhibit A-7) and
various pieces of source code for portions of the PTS Project.

[51] According to Mr. Saini, the Project Timeline contains the details of the activities undertaken and the time spent on each of the activities and was completed as the work was being done. Mr. Saini also testified that it represents the hypotheses National was testing as the coding was being completed.

[52] However, upon reviewing the Project Timeline, I do not agree with Mr. Saini's position.

The Project Timeline lists vague descriptions of the work being completed and some of the specific problems National was trying to overcome along with a corresponding time entry.

While I have found that there was enough evidence to support a conclusion that there were, in fact, hypotheses, this document does not show the formulation, testing and modification of these hypotheses.

Further, there does not seem to be a logical progression between any of the entries in the document.

The Project Timeline does not indicate how any hypotheses were tested and does not list any experimentation or the results of any experimentation.

In addition, there is nothing in this document to indicate that any hypotheses were modified as a result of experimentation.

[53] The Letter is more substantial than the Project Timeline. For Objective 1, the Letter specifies that hypotheses were formulated, that over 50 experiments were conducted and that the hypotheses ultimately proved to be correct.

The Letter also references the document titled "Trials to Achieve Sorting & Paging With Set Constraints" (Exhibit A-7), which is a table outlining 50 experiments and their outcomes.

I do not find this table very helpful.

Several of the experiments are grouped together;

what is being tested is unclear;

how testing is being conducted is also unclear; and

the results listed are vague.

Furthermore, there does not appear to be any reference to the testing or modification of the hypotheses.

No similar document was adduced in evidence with respect to Objectives 2 and 3.

Results:

- response time: 5 seconds (100% of goal)

[63] More specifically, with respect to Objective 1, Mr. Saini testified that the technological advancement had been the development of the “Stitching Mechanism” which made it possible to achieve that Objective.

Conclusion:

TECHNOLOGICAL ADVANCEMENTS CLAIMED

[62] Mr. Saini testified that there was technological advancement in relation to the Objectives of the PTS Project. Specifically, he testified that National invented “Dynamic SQL”.

Further, many steps were taken with a view to attaining each objective, even if they were not all successful.

JUDGE'S ANALYSIS

The judge reviewed the eligibility using the 5 questions cited in the Northwest Hydraulics Case.

1- Was there a technological risk or uncertainty which could not be removed by routine engineering or standard procedures?
2- Did the company formulate hypotheses specifically aimed at reducing or eliminating the technological uncertainty?
3- Did the procedure adopted accord with the total discipline of the scientific method, including the formulation, testing and modification of hypotheses?
4- Did the process result in a technological advancement?
5- Was a detailed record of the hypotheses tested, and results kept as the work progressed?

The judge then further parsed question 2 into several subquestions

[45] As indicated by Justice Bowman in Northwest Hydraulic (at para. 16), the second criterion, i.e., the formulation of hypotheses aimed at reducing the technological uncertainties, involves a five-stage process:

i) The observation of the subject matter of the problem;
ii) The formulation of a clear objective;
iii) The identification and articulation of the technological uncertainty;
iv) The formulation of a hypothesis designed to reduce or eliminate the uncertainty; and
v) The methodical and systematic testing of the hypothesis or hypotheses.

[47] Given the testimony of Mr. Saini and the documents referred to above and adduced in evidence at the hearing, I find, on a balance of probabilities, that National did formulate hypotheses specifically aimed at reducing or eliminating the technological uncertainties raised by the PTS Project.

However, as indicated below under the analysis of the third criterion, Mr. Saini failed to convince me, on a balance of probabilities, that methodical and systematic testing of the hypothes was conducted by National.

Accordingly, the second criterion is not met as it requires the methodical and systematic testing of the hypotheses.

Significant variables addressed: ADO, Classic ASP, COM+ and SQL Server 2000, MTA limitations of framework

Documentation:

- Uploaded to RDBASE.NET: National R&D SRED tax ruling - SI & SRED software - LOSS.pdf (257KB)
- Offline Documents: nature of documents

Uncertainty #2: develop pivot table mechanism

[39] Mr. Saini testified about the technological uncertainties in the PTS Project and to the fact that no similar program already existed. According to Mr. Saini, the technological uncertainties were as follows:

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For Objective 2: how to develop a pivot table reporting in a cross-platform and cross-browser environment;

[37] In respect of Objective 2, Mr. Saini testified that he also conducted internet research, and he referenced one article entitled: “Pivot and Un-Pivot data in SQL” (Exhibit A-4, at p. 82). According to Mr. Saini, the method described in this article only works in a static environment, and was not suitable for National’s needs.

Mr. Saini testified that at that time pivot tables were not available in an application that was accessible through a web browser and that pivot tables had definitely not been used in combination with anything similar to the MTA.

Mr. Saini also researched the PIVOT command available in SQL Server 2005 and concluded that it would not solve the problems encountered by National. Mr. Saini testified that the PIVOT command was only available in SQL Server 2005, and not in SQL Server 2000, which is a different version of the program than the one National was using.

Further, the PIVOT command only worked in SQL Server 2005, and was not necessarily compatible with the other components of the MTA. Finally, National had already purchased SQL Server 2000 and did not have the means to purchase SQL Server 2005. Furthermore, Mr. Saini did not think that the PIVOT command in SQL Server 2005 would even achieve National’s objectives.

[40] The respondent (CRA)... argued that the PIVOT command in SQL Server 2005 would have accomplished Objective 2, and that this was a generally accepted method used by professionals in the area at the time the activities in respect of the PTS Project were undertaken by National.

The most significant underlying key variables are:

static vs.dynamic environment (unresolved), web browser deployment methods

Technology or Knowledge Base Level:

Benchmarking methods & sources for citings:

Benchmark Method/Source	Measurement	Explanatory notes
Internet searches	1 Articles	[37] article entitled: “Pivot and Un-Pivot data in SQL” (Exhibit A-4, at p. 82). According to Mr. Saini, the method described in this article only works in a static environment, and was not suitable for National’s needs.
Suppliers	1 products	the PIVOT command only worked in SQL Server 2005, and was not necessarily compatible with the other components of the MTA. Finally, National had already purchased SQL Server 2000 and did not have the means to purchase SQL Server 2005. Furthermore, Mr. Saini did not think that the PIVOT command in SQL Server 2005 would even achieve National’s objectives.

Activity #2-1: pivot output mechanism (Fiscal Year 2021)

Methods of experimentation:

Method	Experimentation Performed
Analysis / simulation:	5 alternatives
Trials:	3 runs / samples

[24] Work was performed under Objective 2 to develop a mechanism, such as a “pivot-like output” for in-memory array initialization of joint record sets.

The goal was to emulate pivot tables, which is a reporting mechanism in Microsoft Excel that aggregates and summarizes data, but to do so in a web-based program.

Mr. Saini testified that he knew that SQL Server 2005 had a PIVOT command, but that it was not advanced enough to meet the objectives of National. However, National still tried to emulate the functionality of the PIVOT command in SQL Server

2000. National encountered numerous problems and was unable to effectively emulate the PIVOT command in SQL Server 2000.

After attempting other methods that were also unsuccessful and in a final attempt to achieve Objective 2, National tried to integrate SQL Server 2000 reporting services, but this method encountered compatibility issues with portions of the MTA and did not work. Ultimately, this objective was unsuccessful and was never achieved.

Results:

develop pivot output mechanism: 0 0=no 1 = yes (no improvement)

[63] With respect to Objective 2, Mr. Saini testified that the experiments conducted did not bring the results anticipated, as National was unsuccessful in meeting the Objective.

Conclusion:

TECHNOLOGICAL ADVANCEMENTS CLAIMED

[63] With respect to Objective 2, Mr. Saini testified that the experiments conducted did not bring the results anticipated, as National was unsuccessful in meeting the Objective.

ISSUES RELATED TO SUPPORTING DOCUMENTATION:

[54] For Objective 2, the Letter states only that several experiments were done, but does not provide much detail on the number of experiments conducted, how experiments were conducted or the results of the experiments.

Moreover, the Letter does not specify how hypotheses were tested, nor does it specify if or how the hypotheses were modified as a result of the tests. All the Letter indicates is that the hypotheses were incorrect.

AUTHOR'S NOTE:

IT IS ALSO NOTED THAT USE OF "DYNAMIC VS. STATIC ENVIRONMENT" WAS CITED AS AN UNCERTAINTY HOWEVER, NO RELATED EXPERIMENTS OR CONCLUSIONS APPEAR TO BE PROVIDED ON THIS ISSUE.

Significant variables addressed: web browser deployment methods

Uncertainty #3: stateful client control

[39] Mr. Saini testified about the technological uncertainties in the PTS Project and to the fact that no similar program already existed. According to Mr. Saini, the technological uncertainties were as follows:

iii) For Objective 3: how to achieve “deterministic and stateful client-side control”.

[38] In respect of Objective 3, Mr. Saini testified that there was nothing available in the public domain that would allow National to obtain the desired results.

He referred to an article entitled: “What’s the difference between stateful and stateless?” but no copy of this article was tendered as evidence. Additionally, Mr. Saini testified that he conducted research on the internet to see if there was already a solution to the problem posed by Objective 3, but he did not find one.

The most significant underlying key variables are:

section variables and cookies (unresolved)

Technology or Knowledge Base Level:

Benchmarking methods & sources for citings:

Benchmark Method/Source	Measurement	Explanatory notes
Internet searches	1 Articles	[38] Mr. Saini testified that there was nothing available in the public domain that would allow National to obtain the desired results. He referred to article entitled: “What’s the difference between stateful and stateless?” but no copy tendered as evidence. Additionally, Mr. Saini testified that he conducted

research on the internet to see if th

Activity #3-1: deterministic and stateful client-side control (Fiscal Year 2021)

Methods of experimentation:

Method	**Experimentation Performed**
Trials:	5 runs / samples

[25] Work was performed under Objective 3 to develop methods for deterministic and stateful client-side control.

National was trying to develop the ability to pass information from SQL Server 2000 through to the MTA and then to the browser in a manner that would make users believe that all of the previews for their choices were being generated instantaneously, when in fact the data was not pushed from SQL Server 2000 through the MTA to the browser until the actual choice was made.

In order to complete this objective, National tried a few different things. Mr. Saini testified that they first attempted to use section variables and cookies to store the information and make the process appear instantaneous, but that method did not work.

The second method that was attempted was to temporarily store the data at the browser level and to hide that data from the user. Since the browser was unable to store the required amount of data, this method was unsuccessful.

Finally, National developed the “handout” method, which involved a hybrid between ASP and JavaScript that performed recursive posts to the server. The “handout” method resulted in some success.

ISSUES RELATED TO SUPPORTING DOCUMENTATION (SOURCE CODE):

[55] For Objective 3, the Letter indicates that hypotheses were made and vaguely explains how the Objective was achieved. However, it does not explain what experimentation was conducted, how many experiments were conducted, or how the experimentation was conducted, nor does it set out the results in any detail. Additionally, the Letter does not specify how hypotheses were tested, or if they were modified as a result of the testing.

[56] Finally, the evidence adduced by National does include some source code.

[57] By reviewing these pieces of source code, I am not able to determine if they are early versions of the source code, or the final product. Mr. Saini did testify that he had different versions of the source code saved on a server at home, but these versions are not in evidence.

It is worth noting that “GRIDTIMEENTRIES.ASP” and “Gridtimentries.asp with ADO iteration” do at first glance appear to be related. However, no evidence was provided to show if or how these two pieces of code are related.

Additionally, there is no explanation regarding if or how experimentation was conducted in order to advance from one version to the other and which is the later version, nor is there any evidence as to whether or not the experimentation proceeded in accordance with the scientific method.

With respect to the other pieces of source code, I am not able to deduce a trend from a single data point and I do not see any evidence of an advancement of the source code nor is there any evidence as to whether or not it progressed in accordance with the scientific method.

Since I only have one version of most of the source code, and nothing to tell me if or how the other two pieces of source code are related, there simply is not enough evidence on the record to draw a conclusion on this point.

[70] As mentioned above, the evidence contains some pieces of source code.

If National had submitted a revision history - which it did not - or numerous versions of the same piece of code, it may have been possible to determine what tests were conducted and the results of those tests.

However, such is not the case: no explanation of any advancement in respect of the code was tendered as evidence, and I am unable to conclude that what was adduced in evidence is a detailed record of the testing and results.

Results:

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deterministic and stateful client-side control.: 1 0 = no 1 = yes (100% of goal)

[26] The PTS Project never successfully achieved all of the Objectives, although, according to Mr. Saini, there was some degree of success on all three.

[63] with respect to Objective 3, National was able to come up with a viable solution using JavaScript.

Conclusion:

TECHNOLOGICAL ADVANCEMENTS CLAIMED

[62] Mr. Saini testified that there was technological advancement in relation to the Objectives of the PTS Project.

Specifically, he testified that National invented “Dynamic SQL”.

Further, many steps were taken with a view to attaining each objective, even if they were not all successful.

[63] with respect to Objective 3, National was able to come up with a viable solution using JavaScript.

[64] I find Mr. Saini’s testimony credible on this point. As a result, I find that there was some technological advancement in relation to the Objectives of the PTS Project, but not advancement within the meaning of the definition of SR&ED.

As mentioned above, in order to find that a technological advancement was achieved, I would have to first find that technological uncertainties were removed through a process of systematic investigation, which I do not.

Having concluded that National did not carry out systematic investigation to remove technological uncertainties, I cannot find that this criterion is met.

RULING & RATIONALE (LOSS):

[73] While it is not mandatory that the evidence be documentary, and testimonial evidence may be presented, I did not find that Mr. Saini’s testimony made up for the inadequacy of the documentary evidence.

Mr. Saini’s testimony did not detail the methodology behind the testing, how many tests were conducted with respect to each objective (other than Objective 1), how tests differed from other tests conducted or what the results of all of those tests were.

He testified regarding some of the problems National faced for each of the Objectives, but the explanations concerning the tests conducted were vague at best, and there was no discussion of specific measurable results.

From the explanations provided by Mr. Saini, I cannot conclude that there was a “logical progression between each test and preceding or subsequent tests”, and therefore I cannot conclude that National carried out a systematic investigation in respect of the PTS Project.

[74] National has failed to show, on a balance of probabilities, that the procedure adopted in the development of the PTS Project accorded with the total discipline of the scientific method, including the formulation, testing and modification of hypotheses, and that that process resulted in a technological advancement.

Further, National was unable to show that a detailed record of the hypotheses tested and results was kept as the work progressed. Therefore, the activities undertaken by National in developing the PTS Project do not constitute SR&ED.

[75] For these reasons, the appeal is dismissed, with costs to the Respondent.

[AUTHOR'S NOTE: RELEVANCE OF EXPERT WITNESS TESTIMONY]

[5] I [THE JUDGE] did not qualify Mr. Dowd, the expert hired by National for the purposes of this appeal, as an expert witness at the hearing. The Respondent did not call any witnesses.

PERHAPS BASED ON THE LACK OF DOCUMENTATION CITED THE JUDGE ELECTED NOT TO CALL ON THE TESTIMONY OF THE EXPERT WITNESS (MR. DOWD).

IT IS ALSO NOTED THAT USE OF "SECTION VARIABLES WITH COOKIES" WAS CITED AS AN UNCERTAINTY HOWEVER, NO RELATED EXPERIMENTS OR CONCLUSIONS APPEAR TO BE PROVIDED ON THIS ISSUE.

[AUTHOR'S NOTE: COSTS ON THIS CASE AMOUNTED TO $ _____ - CHECK WITH TAX COURT OF CANADA]