

Tax Court of Canada

Revelations Research Limited v. Minister of National Revenue

Christie, A.C.J.T.C.

Judgment: December 6, 1991

Docket: Court No. 89-1001

Counsel: *W.E. Madryga* for the appellant.
A.K. Brown for the respondent.

Christie, A.C.J.T.C.:

1 This is an appeal from an assessment of income tax under Part VIII of the *Income Tax Act*, R.S.C. 1952, c. 148 (am. S.C. 1970-71-72, c. 63) (the “Act”) with respect to the appellant’s 1986 taxation year which was the period May 22, 1985 to May 21, 1986. The alleged liability arises under subsection 194(1). It reads:

194.(1) Every corporation shall pay a tax under this Part for a taxation year equal to 50 per cent of the aggregate of all amounts each of which is an amount designated under subsection (4) in respect of a share or debt obligation issued by it in the year or a right granted by it in the year.

The amount designated was \$31,500,000 and the amount assessed was 50 per cent of that or \$15,750,000 plus interest. What is commonly referred to in commercial law and accounting circles as a “quick flip” was involved. It is the position of the respondent that the appellant is not entitled to a Part VIII refund which is defined under subsection 194(2).¹ This subsection, in turn, relates to subparagraphs 37(1)(a)(i) and 37(1)(b)(i). The first speaks of expenditures of a current nature made in Canada by the taxpayer on scientific research and experimental development related to the business of the taxpayer and directly undertaken by or on behalf of the taxpayer and the second subparagraph speaks of expenditures of a capital nature made under the same circumstances and for the same purpose. Paragraph 37(7)(b) provides that “scientific research and experimental development” has the meaning given to that expression by regulation. Subsection 2900(1) of the Income Tax Regulations (“the Regulations”) provides:

2900.(1) For the purposes of this Part and paragraphs 37(7)(b) and 37.1(5)(e) of the Act, “scientific research and experimental development” means systematic investigation or search carried out in a field of science or technology by means of experiment or analysis, that is to say,

- (a) basic research, namely, work undertaken for the advancement of scientific knowledge without a specific practical application in view,
- b) applied research, namely, work undertaken for the advancement of scientific knowledge with a specific practical application in view, or
- (c) development, namely, use of the results of basic or applied research for the purpose of

creating new, or improving existing, materials, devices, products or processes,

and, where such activities are undertaken directly in support of activities described in paragraph (a), (b) or (c), includes activities with respect to engineering or design, operations research, mathematical analysis or computer programming and psychological research, but does not include activities with respect to

(d) market research or sales promotion;

(e) quality control or routine testing of materials, devices or products;

(f) research in the social sciences or the humanities;

(g) prospecting, exploring or drilling for or producing minerals, petroleum or natural gas;

(h) the commercial production of a new or improved material, device or product or the commercial use of a new or improved process;

(i) style changes; or

(j) routine data collection.

2 The appellant relies exclusively on it being within the ambit of paragraph 2900(1)(c) of the Regulations in support of its appeal.

3 Four testified at the hearing. For the appellant there was its president, W.E. Madryga, Martin Snelgrove and Donald F. Rennick. Peter C. Davies testified on behalf of the respondent. Mr. Madryga has the degree of B.A.Sc. in engineering science which was conferred on him by the University of Toronto in 1947. He is knowledgeable in the field of computer science. Professor Snelgrove received a Ph.D. in electrical engineering from the University of Toronto in 1982 and is an associate professor with the Department of Electrical Engineering at that university. Mr. Rennick received a Ph.D. in mechanical engineering in 1974 from the University of Toronto. From 1975 to 1989 he was employed by Atomic Energy of Canada Ltd., Candu Operations, Mississauga, Ontario. Since then he has been a principal with Cantech International, a division of Naress Associates Ltd., that offers technical services to nuclear and non-nuclear industries. Its main product lines include software applications and development. Software applications have been in databases and expert systems. Mr. Davies received a Ph.D. in mathematics from the University of Toronto in 1979. From December 1979 to May 1985 he was employed by Control Data Canada Ltd. at Mississauga and from February 1986 to the present he has been with Expert Solutions of Toronto. It focuses on consulting, development and training in neural networks, expert systems and other computer applications.

4 Professor Snelgrove and Messrs. Rennick and Davies were found by the Court to be qualified to give expert opinion evidence at the hearing. All three are learned in the field of computer science. The special pursuit of Dr. Snelgrove is the area of signal processing. Mr. Rennick was found to be qualified as an expert regarding data acquisition systems and real-time systems, but not in respect of neural networks. Mr. Davies specializes in artificial intelligence, neural networks and expert systems.

5 Professor Snelgrove made a report dated October 21, 1991, that is in evidence. It is 1 3/4 letter size paper in length. Attached to it is his curriculum vitae and a number of pages pertaining to: research

funding, publications, graduate theses supervised and co-supervised, patents applied for, collaborations, professional activities, administration, teaching, honours and awards, sabbatical and other leaves taken. The oral evidence of this witness does not involve any significant differentiation from his report of October 21 so I shall concentrate on the latter. The first two paragraphs of the report read:

I am writing with my opinion on the eligibility of those parts of your research that are in my area of expertise for consideration as research according to the criteria of appendix B.1 of Revenue Canada information circular 86-4R2.

My own area is signal processing and so I can't comment in detail on the overall project, though it certainly looks to have been extremely technically aggressive in terms of objectives, scale and pace.

6 The Information Circular 86-4R2 referred to by Professor Snelgrove is dated August 29, 1988, which is after the year under review, but it deals with subsection 2900(1) of the Regulations. Paragraph 2.9 is the heading "General Criteria" and this is said in paragraph 2.10:

Essential tests that must be met before any activity can be considered scientific research and experimental development include the criterion of scientific or technological advancement, the criterion of scientific or technological uncertainty, and the criterion of scientific and technical content.

The heading of paragraph 6 reads: "Criteria for the Identification of Eligible Activities in the Fields of Computer Science and Associated Technologies". This follows:

The following discussion addresses the problem of what is an advance directly in computer science and associated technologies. The costs associated with such activities as programming and coding, carried out in support of an eligible activity in other fields are, of course, qualifying expenditures. Further explanations may be found in Appendix B.1.

Appendix B.1 deals with: "Application Paper Computer Software". The three criteria referred to in paragraph 2.10 are dealt with in the particular context of B.1 in paragraphs 2.2 "Scientific or Technological Advancement"; 2.3 "Scientific or Technological Uncertainty"; 2.4 "Scientific or Technical Content". Under 2.3 the "Condition" is:

There is an identified technological uncertainty in computer software and the project attempts to resolve that problem.

The first of the "Positive Indicators" reads:

There is iteration within the project that is caused by encountering technological problems. Note that iteration caused by externally imposed changes in functional specifications that do not create technological uncertainty would not be an indicator.

The "Negative Indicator" reads:

The technological problems being addressed have been overcome by the taxpayer in a previous project on the same operating system and computer architecture.

Under 2.2 the “Condition” is:

The project contributes new knowledge in computer software technology within the context of the taxpayer’s business environment.

The first of the “Positive Indicators” is:

The novelty, or newness of function or product, demonstrates the technological advancement.

The “Negative Indicator” is:

The specific advancement in software technology was publicly available in detail in broadly distributed commercial literature such as widely read personal computer magazines.

Under 2.4 it is said this criterion has both methodological and personnel aspects. There is a subparagraph 2.4.1 that deals with “Methodology” in these words:

Conditions

The technological objectives of the project are documented and a method of achieving them is outlined. (In using this test, note that original ideas may be intuitive, and progress is typically uneven.)

The results of the efforts to attempt to resolve the technological problem are identified, formally or informally.

There is a second subparagraph 2.4.2 that deals with “Personnel” as follows:

Condition

The personnel responsible for the direction or performance of the project have the basic professional skills or experience commensurate with the requirements of the project.

Positive Indicators

The personnel involved in most key positions, such as project leader or technical designer, have experience at the functional levels assigned, or their general background is reasonably related to such an assignment.

Personnel either have technical knowledge of the area where the uncertainty is to be resolved or have set out to obtain such knowledge.

7 The portion of Professor Snelgrove’s opinion that focuses on the issue in this appeal reads:

In terms of Revenue Canada’s criteria, I can say that:

- there would certainly have been considerable “Technological Uncertainty” at the outset that this performance could be obtained. This meets the “Condition” of section 2.3 of the Revenue Canada document above. I am sure, from my experience with real-time signal processing work, that many iterations would have been required to get that level of performance, so the first

“Positive Indicator” is there. I haven’t heard of any project, even to the present day, that would provide the “Negative Indicator” of an existing taxpayer-supported resolution of the same problem on the same or similar machines.

- • that the “Condition” for defining “Scientific or Technological Advancement” (section 2.2, that the project contributes new knowledge) appears to be met for real-time computing technology. It would be interesting to see more details of the software techniques used. The first “Positive Indicator” — novelty of function — is also clear enough. As far as I know the “Negative Indicator” of commercial availability has yet to appear: the closest commercial equivalents run on Macintosh computers with similar CPU’s, but use signal-processing boards based on specialized DSP machines to do real-time Fourier transforms.

- • As to “Methodology” (section 2.4.1): I don’t know what state your planning was in at the time, but I don’t think it would be appropriate to expect anything too formal in the way of plans for something this experimental. I’d normally expect a good systems programmer to spend a few weeks on some initial experiments, then get together with a supervisor to evaluate the chances of success and best strategies.

- • As to “Personnel”: your own background makes you one of the very small number of people with the broad range of systems software skills and hardware understanding needed to do or manage this kind of work. I remember you, from the time we were working together at the Computer Research Facility, as extremely productive and very comfortable with the internal details of large computer systems. In this kind of work I would value the kind of experience you’ve had over more formal qualifications.

The part of the activity I can clearly judge, the data acquisition, is clearly qualified. The overall project is harder for me to judge, but I see no “Negative Indicators”.

8 Mr. Rennick’s report, also in evidence, is dated October 21, 1991. As with Professor Snelgrove the oral evidence of this witness is such that it is unnecessary to go beyond particular reference to his report. The report commences by describing his relationship to Mr. Madryga which arose at the University of Toronto. He states that he has no business relationship with him or any of his companies and that he is not receiving a fee or any other consideration for his opinion. He then describes his professional background and experience. His report goes on:

SCOPE OF MY REVIEW

This review is directed at examining the three criteria related to the tax classification of the research effort by Revelations Research Ltd. I have been given three binders of background information prepared by Bill Madryga. This included a copy of information circular 86-4R2 dated August 29, 1988, superseding the IC 86-4R which was issued in September 1985.² The three criteria are qualifications of the staff, uncertainty in outcome of the research, and technological advancement.³

I need to preface my remarks by noting that considerable time has passed since the dispute. It is therefore difficult to develop an opinion unless I take the information presented to me by Mr. Madryga at face value. At this time, I do not have any reason to believe he has misrepresented the facts. My outlook has been to analyze whether, in 1985, he would have met the criteria for eligibility under Section 2900 of the *Income Tax Act* [sic]. While I realize the sums of money are large, I have

restricted my review to the criteria. Whether the money was well spent is an issue for the investors.

"Technological Advancement" Criterion

The project under review is the invention of a novel neural engine eventually leading to a super microchip capable of simulating intelligence. The work with the supercomputer was to develop and demonstrate the theory, or proof of principle. As I understand it, it was to be based on the biological model of stimuli and response among neurons. The pilot project was to develop a real-time speech processing system based on neural networks.

This kind of architecture was envisioned at the time but has not been fully developed even today. There is no question that it would have been a scientific achievement of mammoth proportions.

The question of scientific process is more difficult to answer. There was a ten year plan. It was a series of milestones, not a written series of items to try or avenues to explore. On the other hand, I understand Madryga's desire for commercial security. This led him to shred all working papers. The size of the research team caused him not to write reports. Related to the demonstration of progress for the first year, a research program of this scope would involve as much as two to five years of startup time, particularly with the small size of personnel resources. For such a program, it is likely that the systems could only be assembled and debugged. However, the dated computer output included with the package under review indicates that a neural engine was constructed in the time frame. I cannot comment on whether this engine was technically correct or a scientific advancement. Nevertheless, it demonstrates that [*sic*] the kernel of knowledge for the program.

"Competence of the Researchers to Perform the Task" Criterion

I have reviewed the resumes of Bill Madryga, Bob Sandness, and Walter Berndl.

I cannot comment on Walter Berndl's or Bob Sandness's⁴ qualifications to perform the work because I did not know them and it is not obvious from their resumes. It is obvious that both had significant data processing and managerial experience. Neither resume shows any scientific computing background. (There are two footnotes in the report regarding Berndl and Sandness. They read: Berndl does have a degree in computer science, which would include some applied mathematics. I note his M.Sc. work focused on development of a SPITBOL compiler. I do not recognize this as scientific computing. Bob Sandness' experience at Bell-Northern Research might have had an element of scientific analysis, but I did not develop the sense that he played a major technical role in the project.) However, I note that a major application of neural networks has been in the banking, business, and commercial market so it would be natural for them to have had exposure to artificial intelligence there. I cannot say whether they did.

One of the auditors commented that neither researcher had advanced degrees in Mathematics. Bill Madryga graduated in Engineering Science from the University of Toronto with a major in computer science. Engineering Science were (are) the elite of the Engineering Faculty at U of T. For example, the men who placed 1st, 3rd and 5th in my final year (I was 2nd) moved to Mechanical Engineering because the theoretical course work was too onerous for them in Engineering Science. While I do not know Madryga's course work specifically, I know from personal experience that Eng. Sci. offers more advanced mathematics than any other Engineering discipline. In fact, my graduate course in mathematics was taken concurrently with 4th year Engineering Science and Math Physics and Chemistry (MPC) students. There were also graduate students in Mathematics in that course. So I conclude that Madryga should have had the mathematical basis to carry out the advanced research.

I note also that Madryga had more than 10 years following graduation in engineering-related data processing and hardware applications.

Initially, I shared the auditor's concern that the principle researchers had not published in the neural networks discipline. However, if their project had been successful, it would have definitely been "publishable" but probably would not have been for commercial reasons. This is not unusual in research: oil companies do not publish all their research.

It is impossible for me to tell what knowledge Bill Madryga or Walter Berndt had of neurobiology in 1985. However, this has been written about extensively in technical journals and should have been available to him. The notes which exist for 1987 show the general principles were understood.

"Element of Uncertainty" Criterion

Neural Networks is an emerging technology which has the potential to revolutionize modelling of physical processes in every aspect of society. In 1985, people were just beginning to develop methods for simulation of neurobiological processes. In spite of tremendous effort by scientists and mathematicians world wide, it has not been perfected today. There is no question in my mind that the outcome could not be assured at the start of the project in 1985.

ADDITIONAL COMMENTS

From the documentation presented, it seems there were encouraging (albeit not binding) statements made as to the eligibility of this program for classification as Scientific Research and Experimental Development. In addition, guidelines were not published until after the project was underway. The lack of a formal statement of eligibility led to the early collapse of the program, which as it turns out, delayed or suspended the statement of eligibility because of the apparent lack of demonstrated progress. Catch-22. In spite of this, the project does appear to meet all three criteria.

9 To a considerable extent the oral evidence of Mr. Madryga is directly related to three volumes of documents assembled by him for the purposes of this appeal. They are dated September 20, 1991. Much of it is of no assistance in determining the fundamental issue before the Court. There are, for example, pages of computer printouts to which no evidentiary weight can be attached. The same can be said of some of the supplementary documents filed in evidence at the trial.

10 The work carried on by the appellant that is said to be scientific research and experimental development within the meaning of paragraph 2900(1)(c) of the Income Tax Regulations is a project labelled "Synthetic Intelligence". It is said early in volume 1 that: "The key reference for eligibility is the Revenue Canada Information Circular IC86-4R2 which was developed in consultation with Canadian industry." This information bulletin has already been considered in conjunction with the evidence of Professor Snelgrove and Mr. Rennick. The documentary material is divided into ten parts: Project, History and Issues; General Eligibility; Activity Eligibility; Technical Staff; Reports (that include a "10 Year Plan"), etc. The goal of the project is said to be: "The ultimate objective of the SI project is to develop a hardware SYSTEM constructed of elements similar to biological neurons which is capable of performing arbitrary non-numerical (functions), e.g. pattern recognition, rule interpretation." Later it is said under the heading "Synthesis of natural intelligence" that:

This is the prime objective of the research. It seeks to develop a cellular network model of natural intelligence. This network should be capable of representing information to the same abstraction level as in human intelligence. Rather than have an encoding scheme for information imposed on it

by a programmer, it will be able to develop its own storage representation based on the nature of the information. Some preliminary work has already been completed for the representation of the cellular network.

11 It is unnecessary to review particular aspects of the evidence of Mr. Madryga because I have no hesitation in accepting Mr. Davies' evaluation of the appellant's project which is quite the contrary of what is contended by the former.

12 Mr. Davies was retained by Revenue Canada to advise whether, in his opinion, the appellant's project could properly be regarded as "scientific research and experimental development" within the meaning to be attributed to those words in the applicable legislation. After having met with Mr. Madryga and after examining documentation that included material originating with the appellant and material supplied by Revenue Canada, he concluded in a report dated July 14, 1988, that: "I have no hesitation in stating that I find no part of this project to be eligible as scientific research or experimental development."

13 Subsequently he reviewed the contents of the three volumes referred to; the reports of Professor Snelgrove and Mr. Rennick that are in evidence; the supplementary material placed in evidence at trial and he was present in Court when Professor Snelgrove and Messrs. Rennick and Madryga testified.

14 What follows are some of the points made in the course of Mr. Davies' testimony that I believe merit special emphasis. He has evaluated some 10 or 11 other projects for the same purpose as the project relevant to this appeal. In each instance except two he made a finding favourable to the taxpayer. In one of the two exceptions he found that "the majority of the work qualified." The other exception is the case at hand. He said:

When I looked at the overall project, I was concentrating of course on the documents from Revelations Research and I was looking in that documentation for a research plan, a systematic outline of how Revelations Research proposed to achieve these goals. The only thing in there I found that could be termed a plan of any kind was the ten year plan overview, and that to me was not a research plan, it was a list. It had the ten years of goals, but there was no mention of how the company would achieve any of those goals. It might have served as part of a business plan, but it certainly wasn't a research plan.

With respect to the necessity of a research plan he added: "If you have no idea in what direction you are going, I don't see any possible reason for assuming that you will get to your goal." Detailed notes of research work done were not produced. He answered no to this question: "Did you receive any information setting out initial hypotheses or any proposed means of determining the truth or falsity of these hypotheses?" With reference to the qualifications of Messrs. Madryga and Berndt he said: "They certainly have impressive work credentials, both gentlemen, particularly Mr. Madryga, but no work experience in the central areas of this project." This exchange between counsel for the respondent and Mr. Davies follows:

Q. You also say finally that project success could be a factor in assessing the qualifications of the team?

A. Certainly. In the absence of anything else, if they had managed to attain any of the goals they had set out to, this would tend to make you believe that they could do it, so it would tend to qualify

them, but there was none of this, there was nothing significant accomplished at all.

He went on:

The staff was not appropriate to this project. Both Mr. Madryga and Mr. Berndl would have been excellent candidates to be part of such a project team, but they could not, neither gentlemen could not have been one of the principal researchers ... I concluded that the project was not eligible. The work was not carried out in any systematic, scientific manner. Mr. Madryga had some ideas which he believed might prove fruitful, but he didn't have any plan of how he was going to go about implementing that. The research team, as I mentioned, was inadequate in terms of size and in terms of the credentials of the people on the team.

He observed that "neural network activity" was the "central activity" of the project.

15 In *Sass Manufacturing Ltd. v. Minister of National Revenue*, [1988] 1 C.T.C. 2524, 88 D.T.C. 1363, Judge Sarchuk of this Court said at page 2535 (D.T.C. 1371):

The evidence falls short of establishing the existence of any systematic investigation or search carried out in a field of technology by means of experiment or analysis. In my view Regulation 2900 requires an appellant to adduce cogent evidence of such investigation or search. 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.

16 This appeal falls to be decided by the weight or credibility or both of the evidence adduced at trial. The evidence of Professor Snelgrove and Mr. Rennick does not of itself satisfy me that what was done by the appellant regarding the synthetic intelligence project falls within the scope of scientific research and experimental development as defined in paragraph 2900(1)(c) of the Regulations. That evidence is somewhat restrained and only partially supportive of the appellant in both instances. With respect to the evidence of Mr. Rennick it must be borne in mind that he was found not to be eligible as an expert witness with reference to neural networks which was central to the appellant's project. To the extent that Mr. Madryga's evidence is in meaningful conflict with the evidence of Mr. Davies the latter prevails. In this regard Mr. Davies concluded in July 1988 that the appellant's project was not "scientific research or experimental development" and after considering the evidence adduced at trial on behalf of the respondent he reaffirmed this evaluation without hesitation. Further, it has not been established that there was any systematic investigation or research carried out of the nature described in *Sass Manufacturing Ltd.*

17 In the circumstances this appeal cannot succeed.

Appeal dismissed.

Footnotes

¹ It reads:

194. (2) In this Act, the "Part VIII refund" of a corporation for a taxation year means an amount equal to the lesser of

(a) the aggregate of

(i) the amount, if any, by which the scientific research and experimental development tax credit of the corporation for the year exceeds the amount, if any, deducted by it under subsection 127.3(1) from its tax otherwise payable under Part I for the year, and

(ii) such amount as the corporation may claim, not exceeding 50% of the amount, if any, by which (A) the aggregate of all expenditures made by it after April 19, 1983 and in the year or the immediately preceding taxation year each of which is an expenditure (other than an expenditure prescribed for the purposes of the definition “qualified expenditure” in subsection 127(9) claimed under paragraph 37(1)(a) or (b) to the extent that such expenditure is specified by the corporation in its return of income under Part I for the year exceeds the aggregate of

(B) the aggregate of all expenditures each of which is an expenditure made by it in the immediately preceding taxation year, to the extent that such expenditure was included in determining the aggregate under clause (A) and resulted in

(I) a refund to it under this Part for the immediately preceding taxation year,

(II) a deduction by it under subsection 37(1) for the immediately preceding taxation year, or

(III) a deduction by it under subsection 127(5) for any taxation year, and

(C) twice the portion of the aggregate of amounts each of which is an amount deducted by it in computing its income for the year or the immediately preceding taxation year under section 37.1 that can reasonably be considered to relate to expenditures that were included in determining the aggregate under clause (A); and

(b) the refundable Part VIII tax on hand of the corporation at the end of the year.

² Information Circular 86-4R was issued on September 25, 1987.

³ As will be seen from what has already been said in relation to Professor Snelgrove’s evidence, the three criteria referred to in paragraph 2.10 of IC86-4R2 are the criterion of scientific or technological advancement, the criterion of technological uncertainty and the criterion of scientific and technical content. Also noted regarding that evidence is that in Appendix B.1 it is said that scientific and technical content consists of two components, namely, “methodology” and “personnel”.

⁴ These individuals were at one time associated with Madryga regarding the activities of the appellant. Berndt is described by Madryga as a “Scientist and Operations Manager” and Sandness as a “Contract Technical Advisor.” Neither of them testified at the trial.