

North Broken Hill Limited and Industry Research and Development Board No: V93/34 Aat [1993] AATA 254; (1993) 26 ATR 1262 (1993) 18 AAR 177 (1993) 30 ALD 200 (11 August 1993)

ADMINISTRATIVE APPEALS TRIBUNAL

NORTH BROKEN HILL LIMITED v. INDUSTRY RESEARCH AND DEVELOPMENT BOARD

No: V93/34

AAT No. 8912

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Industry Research and Development

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COURT

ADMINISTRATIVE APPEALS TRIBUNAL

GENERAL ADMINISTRATIVE DIVISION

I.R. THOMPSON (Deputy President), D.L. ELSUM (Member) AND W.G.

McLEAN (Member)

CATCHWORDS

Industry Research and Development - research and development activities - design and implementation of production tracking system in paper mill - whether it involved innovation or technical risk - use of existing technology not innovative by being in a new environment - must be development or new use of the technology - whether technological uncertainty about outcome

Industry Research and Development Act 1986 ss. 39L, 39S, 39T

Income Tax Assessment Act 1936 ss. 73B(1), (2)(g), (2A), (34), (35)

Income Tax Assessment Amendment (Research and Development) Act 1986

Industry, Technology and Commerce Legislation Amendment Act 1991

Research and Development Legislation Amendment Act 1988

Taxation Laws Amendment Act (No. 4) 1989

Acts Interpretation Act 1901

HEARING

BURNIE, 1 and 2 July 1993

MELBOURNE, 5, 7 and 22 July 1993

11:8:1993

Counsel for the Applicant: Mr T. Murphy

Solicitors for the Applicant: Blake Dawson Waldron

Counsel for the Respondent: Mr T. Ginnane

Solicitors for the Respondent: Australian Government Solicitor

ORDER

The Tribunal decides to affirm the decision under review.

1. Being satisfied that it is desirable to do so by reason of the confidential nature of the matters referred to in this proceeding, the Tribunal orders, pursuant to sub-section 35(2) of the Administrative Appeals Tribunal Act 1975, that the disclosure of the reasons for the decision in this proceeding is prohibited except to the parties, their legal representatives, the members of the Tribunal as constituted to hear these matters, and the staff of the Tribunal and of Auscript for the purposes of this proceeding;
2. This order shall extend only until 13 September 1993; and
3. The parties may make written submissions to the Tribunal within 21 days of the date of this order if either or both believe that any part of the reasons for the decision should continue after 13 September 1993 to be subject to an order prohibiting disclosure of that part.

DECISION

I.R. THOMPSON, D.L. ELSUM AND W.G. McLEAN On 13 March 1992 the Commissioner of Taxation requested the respondent, pursuant to section 39L of the Industry Research and Development Act 1986 ("the IR & D Act"), to give him a certificate stating whether a project, carried on by the applicant and known as the "Product Tracking System" ("PTS") project, was a research and development activity. (It may be noted that in these proceedings the PTS was described also as a production tracking system.) The respondent had one of its officers inspect the PTS in operation at the applicant's paper mill in Burnie; he expressed the opinion that it came within the definition of research and development "in the Act" and recommended issue of the certificate. It is not clear whether he was referring to the

IR & D Act or the Income Tax Assessment Act 1936 ("the Assessment Act"). In spite of his recommendation, the Tax Concession Committee of the respondent, as the respondent's delegate, decided that the activity related essentially to the development of computer software and, as the requirements of section 73B(2A) of the Assessment Act were not met, was not within the definition of "research and development activities" in section 73B(1).

2. A firm of accountants engaged by the applicant had been in correspondence with the respondent about the matter and was informed of the decision. On behalf of the applicant it requested the respondent, pursuant to section 39S of the IR & D Act, to reconsider it. The respondent arranged for another of its officers to inspect the PTS and to provide it with a report. She did so and reported that she considered that the activities undertaken by the applicant between 1985 and the date of her inspection came within the definition of research and development activities in section 73B(1) of the Assessment Act. Nevertheless, the Tax Concession Committee as delegate of the respondent again came to the conclusion that the core research and development activities were software and did not satisfy section 73B(2A) of the Assessment Act and decided also that the introduction of computer hardware into the PTS did not satisfy the definition of research and development in section 73B(1). It, therefore, confirmed its previous decision. The applicant then applied to the Administrative Appeals Tribunal, pursuant to section 39T of the IR & D Act, for review of the decision so confirmed.

3. At the hearing of the application the applicant was represented by Mr T. Murphy, of Counsel; the respondent was represented by Mr T. Ginnane, of Counsel. In addition to the documents lodged with the Tribunal pursuant to section 37 of the Administrative Appeals Tribunal Act 1975 ("the T documents"), the Tribunal received in evidence copies of a "Feasibility Study for a Computerised Production Tracking System" for the applicant's Burnie mill dated August 1985, a document listing the computer nodes of the PTS and a report dated April 1988 on the then current status of the PTS. It received in evidence also copies of pages from a commercial catalogue of interface converters, a copy of electrical standard No. RS-422 published by the Electronic Industries Association in Washington, USA, in 1975, a copy of National Semiconductor Application Note 214 dated October 1978 relating to transmission line drivers and receivers for EIA standards RS-422 and RS-423, and a copy of a page of a publication by Texas Instruments Incorporated of Dallas, USA, relating to EIA standards and in particular a history of standards RS-232 and RS-422. Finally, it received copies of the Explanatory Memorandum provided to the Parliament with the Bill for the Income Tax Assessment Amendment (Research and Development) Act 1986 ("the 1986 amending Act") and of the second-reading speeches in respect of that Bill in the Senate and the House of Representatives. Oral evidence was given on behalf of the applicant by a number of members of its staff, Mr A. G. Jamieson, Mr R. E. Scott-Young, Mr C. A. McLennan, Mr J. W. Graham, Mr G. L. Kristensen, Mr W. R. Brookes and Mr T. J. Purdy. Oral evidence was given on behalf of the respondent by Mr T. D.

Sandeman, a senior consultant with Price Waterhouse Urwick, and Associate Professor C. E. Peterson, who is a computer systems engineer and a member of the respondent's Tax Concession Committee.

4. The activities with which we are concerned in these proceedings began in 1985. Section 73B was added to the Assessment Act by the 1986 amending Act, which came into operation on 25 June 1986. Section 73B(14) provided for the allowance of a deduction from the assessable income of an eligible company for research and development expenditure greater than \$20,000 incurred by the company in any year of income. It is not in dispute that the applicant was an eligible company at all relevant times. Its year of income which ended on 30 June 1986 was the first year in respect of which a deduction could be claimed.

5. "Research and development expenditure" was defined in section 73B(1) as follows:-

"research and development expenditure', in relation to an eligible company in relation to a year of income, means expenditure (other than expenditure incurred in the acquisition or construction of plant or a building or of an extension, alteration or improvement to a building) incurred by the company during the year of income, being -

- (a) contracted expenditure of the company;
- (b) salary expenditure of the company, being expenditure incurred during the deduction period; or
- (c) other expenditure incurred during the deduction period directly in respect of research and development activities carried on by or on behalf of the company during the deduction period;"

The expressions "contracted expenditure" and "salary expenditure" were defined in section 73B(1) in terms of expenditure on research and development activities.

6. The definition of "research and development activities" in section 73B(1), which remained the same for the whole of the period of the activities with which we are concerned in these proceedings, was as follows:-

"research and development activities' means -

- (a) systematic, investigative or experimental activities that -
 - (i) are carried on in Australia or in an external Territory;
 - (ii) involve innovation or technical risk; and
 - (iii) are carried on for the purpose -
 - (A) of acquiring new knowledge (whether or not that knowledge will have a specific practical application); or
 - (B) creating new or improved materials, products, devices, processes or services; or

(b) other activities that -
(i) are carried on in Australia or in an external Territory;
and
(ii) are carried on for a purpose directly related to the carrying on of activities of the kind referred to in paragraph (a);"

7. From the time when section 73B was added to the Assessment Act until 25 April 1988, sub-section (2) of that section was as follows:-

"73B. (2) For the purposes of the definition of 'research and development activities' in sub-section (1), activities that are carried on by way of -
(a) market research, market testing or market development, or sales promotion (including consumer surveys);
(b) quality control;
(c) prospecting, exploring or drilling for minerals, petroleum or natural gas for the purpose of determining the size or quality of any deposits;
(d) the making of cosmetic modifications or stylistic changes to products, processes or production methods;
(e) management studies or efficiency surveys;
(f) research in social sciences, arts or humanities;
(g) the development of computer software otherwise than for the purpose of sale, rent, licence, hire or lease; or
(h) the making of donations,
shall be taken not to be systematic, investigative or experimental activities."

8. With effect from 26 April 1988 paragraph (g) was omitted from section 73B(2) but was replaced by a new sub-section, sub-section (2A). That sub-section was as follows:-

"73B. (2A) For the purposes of the definition of 'research and development activities' in sub-section (1), activities carried on by or on behalf of an eligible company by way of the development of computer software shall not be taken to be systematic, investigative or experimental activities unless the computer software is developed for the purpose, or for purposes that include the purpose, of sale, rent, licence, hire or lease to 2 or more non-associates of the company (counting a non-associate of the company and the associates of such a non-associate together as one person)."

That new sub-section remained in force for the rest of the period with which we are concerned in these proceedings, as did sub-section (2) with paragraph (g) omitted.

9. When section 73B was added to the Assessment Act, provision for the respondent to determine in writing whether particular activities were research and development activities and for requests for such determinations to be made was contained in sub-sections (34) and (35) of that section. However, the Research and Development Legislation Amendment Act 1988 ("the 1988 amending Act") amended both the Assessment Act and the IR & D Act by repealing sub-sections (34) and (35) of the former and by adding to the latter a new section 39L which was as follows:-

"39L. The Board may, and shall if requested in writing by the Commissioner to do so, give to the Commissioner a certificate stating whether particular activities that have been or are being carried on by or on behalf of an eligible company were or are research and development activities."

Subsequently "a person" was substituted for "an eligible company" by the Taxation Laws Amendment Act (No. 4) 1989.

10. A new sub-section (34) was added to the Assessment Act by the 1988 amending Act; it provided that a certificate given by the respondent stating whether particular activities were research and development activities was binding on the Commissioner of Taxation for the purposes of making an assessment of the taxable income of the company which had engaged in those activities.

11. To complete the account of the relevant legislation, we note that sections 39S and 39T of the IR & D Act, providing for internal review of inter alia decisions made under section 39L and for review by the Administrative Appeals Tribunal of decisions confirmed or varied under section 39S, were added to the IR & D Act with effect from 15 June 1991 by the Industry, Technology and Commerce Legislation Amendment Act 1991.

12. The PTS which is the subject of these proceedings is now in operation at the applicant's Burnie paper mill. At the request of the applicant the Tribunal visited the mill on the first day of the hearing and was shown the manufacturing, finishing (i.e. cutting and packaging) and despatch processes in relation to which the system operates. We were shown the components of the system and their locations, other than the pulp section of the mill; we were also shown the equipment used for the manufacturing, finishing and despatch processes, so that we might better understand the evidence given regarding the PTS.

13. Essentially, the PTS has one mini-computer, which is a Stratus computer, and 20 to 25 "intelligent" micro-computers, all personal computers, which are in turn connected to terminals and in some cases to printers, bar code readers and other equipment. The Stratus computer receives and transmits from and to the applicant's mainframe computer, and stores, information relating to customers' orders for the applicant's products. It also receives and transmits from and to the personal

computers, and stores, information about those orders and about the products manufactured in the mill. The PTS involves a two-way communication between the Stratus computer and the personal computers, each of which is situated in a different place in the offices and the factory at the mill. The communication is by cable but, because many of the personal computers are at a considerable distance from the Stratus computer, the signals from the Stratus computer, for which the RS-232 standard is used, have to be converted en route to the RS-422 standard by the use of interface converters. They have then to be converted back again to the RS-232 standard by similar converters before entering the personal computers. The same process occurs in reverse for signals from the personal computers to the Stratus computer.

14. A few of the personal computers are interfaced with items of equipment, e.g. equipment for carrying out tests of quality and for printing labels, bar codes and despatch documentation, so that the operation of that equipment is controlled through the PTS. Mainly, however, the system provides information from the Stratus computer to human operators of the personal computers and from those human operators to the Stratus computer. The Stratus computer was bought "off the shelf" from Olivetti; the personal computers are also standard equipment bought from Olivetti. The converters were manufactured by another company, not related to the applicant, in accordance with specifications prepared by Mr Brookes, who is the power and control support engineer at the Burnie mill and was the chief design engineer for the PTS project. Modifications had to be made to the firmware of the Stratus computer after it was installed. Circuit boards at the back of the personal computers which were linked to the equipment controlled through the PTS were bought from a commercial supplier but modifications had to be made to them after their installation.

15. The applicant manufactures over 1,000 different paper products. A number of different types and grades of paper are produced. The product can be packed either on reels of various sizes or in sheet form, uncut or cut. It can be cut into a number of different sizes. If in sheet form, it can be packed in packages of various sizes. Once packed, the paper is then prepared for despatch. The number of reels or packages of cut paper stacked on a pallet and the type of pallet used vary according to each customer's requirement. Several pallets may be stacked on top of one another and secured together, if that is what the customer wants.

16. The PTS relays customers' requirements to the persons operating the manufacturing and finishing machinery in the factory, so that they are able to set it in such a way that it produces paper of the required type, in the right form, and packed according to the customer's requirements. It enables jobs to be designed in such a way that there is a minimum wastage of the paper that is manufactured. It automatically causes a label to be printed for each order, with identifying details. It relays to the despatch personnel each customer's requirements for the stacking of the reels or packages. Some of the computers with which the mainframe is linked

are in the offices of the applicant's sales staff throughout Australia. The PTS enables those staff to ascertain immediately the progress which has been made in giving effect to any order that has been placed by a customer, so that they can answer accurately and without delay any query about it by the customer.

17. Evidence was given by the applicants' witnesses about the situation which existed before the PTS was in operation. Information of the type which is now put into the system by the persons operating the personal computers was previously recorded in writing. That was done at a number of different sites within the mill. The totality of that information had then to be collated and co-ordinated with details of customers' orders. It was very difficult to co-ordinate the manufacturing process with the processes which followed it, i.e. the packaging on reels of different sizes or as sheets, cut or uncut, in such a way that there was not a substantial wastage. If a roll of paper, manufactured to meet a customer's order, was not of the type or quality required for that order, it was difficult to allocate it to another customer whose requirements it would meet. It was virtually impossible for sales staff to answer either quickly or accurately any queries received from customers about the progress of their orders. The recording of information in writing and its subsequent collation was labour-intensive.

18. When the applicant's the accountants sought reconsideration of the respondent's decision they made a lengthy written submission in which they described the steps taken by the applicant which had resulted in the previous system being replaced by the PTS. It described those steps as follows:-

"The PTS effectively involved three discrete and separate R & D projects:

Project 1. The identification of the inefficiencies of the APPM Burnie mill process, the systematic research conducted to identify the appropriate solutions to overcome these inefficiencies and the identification of the appropriate solution;

Project 2. The acquisition and installation of computer hardware and

Project 3. The identification, implementation and development of computer software."

19. Evidence of the activities undertaken from inception to completion of the PTS was given by the witnesses called on the applicant's behalf. They related how a project team consisting of Mr Scott-Young, Mr McLennan, Mr Graham and Mr Kristensen had been formed into a project team to carry out what the accountants described in their submission as "Project 1". They gave evidence that they worked under the supervision of a steering committee of more senior employees. It was their work which resulted in the production of the feasibility study for a computerized tracking system of which a copy was tendered in evidence. They

gave evidence that developments in the paper manufacturing industry had resulted in direct competition from another company which had previously not competed directly with the applicant. There was a need to attract customers. The applicant's inability to give quick and accurate information to its customers about the progress of their orders was a cause of dissatisfaction. There was a need to devise a system by which such information could be ascertained readily and provided immediately upon request. That, Mr Scott-Young said, had been the principal factor which had induced the applicant to establish the steering committee and the project team.

20. There is no significant dispute between the parties about the activities undertaken by the applicant and its employees which resulted in the present situation of there being a PTS in operation at its Burnie mill. The dispute is concerned only with the characterization of those activities, that is to say whether they come within the definition of "research and development activities" in section 73B(1). By 1985 the applicant had already installed a PTS at another of its paper mills, at Shoalhaven. That system was more limited in scope than the PTS eventually devised for Burnie. However, it is clear that, from the time when the project team was formed at the Burnie mill, the applicant envisaged that the solution to that mill's problems would be found in the development of a PTS. Mr McLennan, who is a computer systems analyst, had been sent some years earlier to Shoalhaven to plan a PTS for that mill. He was moved by the applicant to Burnie in 1984 or 1985 especially to work on plans for a PTS there. He gave evidence that the PTS was envisaged as having two purposes, first to provide good customer service and second to streamline the production process.

21. In 1985 Mr Jamieson was the technical superintendent at the Burnie mill, in charge of 40 employees whose task was to monitor and develop quality control of the applicant's products. If a customer had a complaint about the quality of the product manufactured and supplied to him, it was referred to Mr Jamieson's department. He was, he said, a member of the steering committee, as representative of the Technical Department, to see whether the PTS would assist in monitoring and control of quality in the production process.

22. Mr Scott-Young, who was the senior project engineer at the Burnie mill in 1985, was the project manager in charge of the project team. He gave evidence that he had a background in engineering projects and that his role as a member of the team was to control costs and to see that the job was properly controlled. He said that he did not have a background in computers. He was responsible for presenting proposals to the directors of the company in the way in which proposals for new projects were customarily presented. He said that there were two criteria by which the project could be judged, whether it provided a better service to customers and whether it resulted in a better return on investment by replacing clerical staff and reducing the amount of waste paper. Because the PTS would replace the existing manual system and because the mill operated 24 hours a day on 7 days a week, it was essential, he said, that the PTS should be very reliable.

23. Because the PTS was to be computer operated, once the project team had identified what it wanted the system to achieve, the main thrust of its investigations was directed to identifying what computer equipment could do the job properly at the least cost. Although there were problems to be overcome, such as the possible effects on components of a PTS of the electrically noisy atmosphere of the mill and vibration caused by the heavy manufacturing plant, there appears to have been no doubt in the minds of the members of the project team that it should be possible to find appropriate equipment and to design an appropriate system based on it. Indeed, it is clear, particularly from the evidence given by the witnesses called by the respondent, that the appropriate computer technology had been developed for several years before 1985 and that suitable equipment had been commercially available for at least the previous two years. Essentially, therefore, the task of the project team was to identify what functions the PTS was to perform, then to ascertain what computer equipment might perform those functions and finally to cost the project. That was essentially what it did; it then produced the feasibility study in August 1985.

24. The PTS which had been installed at the Shoalhaven mill was not as extensive as the one which the project team decided needed to be installed at the Burnie mill. At the Shoalhaven mill the packaging and despatch of the products was handled manually and not by mechanical equipment, as it was at the Burnie mill. The PTS at Shoalhaven, therefore, did not extend to the packaging and despatch area of the mill's operation. The PTS to be installed at the Burnie mill was required to do so.

25. The need for the PTS to be totally reliable had been met at Shoalhaven by installing two central computers in both of which all the information was stored but only one of which transmitted information at any one time. Such redundancy was incorporated into the system so that, if the computer transmitting the information broke down at any time, the second computer would take over that role immediately. Special software had to be written to ensure that that occurred. The early 1980s were a time of rapid development in the design of computers and in particular several fault-tolerant computers had come onto the market; the Stratus computer was one of them. Further, computers suitable to be used as "intelligent" terminals, in particular personal computers, had been developed. The project team wished to design a PTS which took advantage of those advances in computer development.

26. Having determined what functions the PTS would be required to perform, the project team undertook an investigation of the computers which were available and which might be suitable for the PTS. It came to a conclusion that the Stratus computer linked to personal computers as "intelligent" terminals would serve the applicant's purposes best. It also came to the conclusion that a star-form linkage, rather than a local area network as used at Shoalhaven, would best suit the requirements of the system. It was on that basis that it prepared the feasibility report, which included an estimate of the cost of installing such a PTS. Having

considered the report, the directors of the applicant gave their approval for the project to continue.

27. The project team then made enquiries to ascertain whether there was any PTS in operation in a paper mill anywhere using computers of the type and in the manner which they had recommended in the feasibility study. Several of them went to the USA to look at paper mills there. Although some had production tracking systems, the systems were either much smaller, operated in a different manner, had not been implemented successfully or were still in a trial period where modifications were being made to the systems in an attempt to correct faults. No enquiries were made to ascertain whether production tracking systems were being successfully operated in overseas countries other than the USA or in any other manufacturing industry, although the team ascertained that the Stratus computer had been used by banks; there it had been linked to automatic teller-machines and the systems had operated successfully.

28. After the visit to the USA it was decided that, as no PTS such as the applicant wanted had been found operating in a paper mill elsewhere, the applicant's employees should design the PTS which it required for its Burnie mill. They then set about doing so. Mr Kristensen, who was at that time employed by the applicant as an instrument engineer, was assigned the task of designing the linkage of the Stratus computer with the personal computers. He realized immediately that, because of the long distances between the Stratus computer and some of the personal computers, it would be necessary to convert the signals emitted by the computers from the RS-232 standard to the RS-422 standard. The RS-422 standard had been published in 1975 by the Electronic Industries Association in the USA with full details of the technology involved. It is clear from the evidence of Mr Kristensen as well as that of the respondent's witnesses that conversion of the signals to the RS-422 standard was a course that would have been obvious to anyone having the appropriate professional qualifications to undertake the task which Mr Kristensen was undertaking.

29. Ideally, Mr Kristensen would have liked to use for the linkage a high quality shielded cable. However, the applicant had set a low limit on the amount of money that could be spent on the implementation of the system; so Mr Kristensen had to design the linkage using the cheapest cable that would do the job. That was standard twisted pair telephone cable. However, the use of such cable conformed with the requirements of the RS-422 standard. In the details of the standard there are included details of interconnecting cable characteristics and it is stated expressly that "most commonly available cable used for telephone applications should meet these specifications".

30. Computer hardware in the form of converters was required for the conversion of the signals from the RS-232 standard to the RS-422 standard. Such converter boxes could be bought "off the shelf" from a supplier in Australia. They would

have cost in excess of \$500 each. Again, the financial constraints imposed by the directors prevented their use at that price. However, the supplier would almost certainly have reduced the price per converter box if a bulk order had been placed for the total number of converters required for the Burnie PTS. That was not investigated and thus the decision was made without properly testing a replacement price against the amount approved by the directors. The task of designing a cheaper converter was assigned to Mr Brookes. The converter boxes available commercially incorporated a power supply component; Mr Brookes decided that, as a considerable number of them were to be installed together in one place in the same room as the Stratus computer, it would be considerably cheaper to have one power supply unit for all those converters and not to incorporate a power supply in the converters which he designed. However, it is clear from the evidence of Mr Brookes and that of Professor Peterson that the designing of the converters was a comparatively simple task. The chips to be used were available - and were purchased - commercially and the function which each chip performed was known generally to persons having Mr Brookes background as a power and control support engineer. Although there were no converter boxes available commercially which did not incorporate a power supply, essentially what Mr Brookes designed performed precisely the same function of conversion by the same means as that performed by the commercially available converter boxes and simply relied on an external power source instead of incorporating one.

31. The task of designing the computer software was assigned to Mr McLennan. He gave evidence that computer software, rather than computer hardware, was the area of his own expertise. As 20-25 personal computers were to be located in the same number of different places in the offices and factory of the mill and as different tasks were being performed by people or by mechanical equipment at each of those places, the designing of the software was a very large and complex task. Once it had been designed, however, by Mr McLennan, the task of actually writing the individual programmes for each personal computer was comparatively simple. It was undertaken by, among others, several students.

32. When the system had been designed within the cost constraints set by the directors of the applicant, the computers and the cable were bought, the converters were manufactured, the equipment was installed and the software programmes were written. By April 1988, when a report on the current status of the PTS at the Burnie mill was written, the PTS was in operation and was stated to be "covering all despatches and 95% of internal processing". It was reported that the majority of "deliverables" which had been promised were already being achieved and that the project had been carried out within the capital approved and "in the main, within the time frame initially estimated (18 months)". It was reported that the system reliability was excellent and in particular that there had been no Stratus failures, that personal computer and other hardware failures had been almost non-existent, that a communication software problem had been overcome and there had been no failure for over three weeks and that the system response time was satisfactory.

33. Soon afterwards Mr Purdy, who is now the Finishing and Distribution Manager at the applicant's Burnie mill, took over responsibility for resolving the remaining problems with the PTS. There were two major problems. The first involved communication between the Stratus computer and the personal computers; the second involved communication between some of the personal computers and the equipment which they controlled. Modifications had to be made to the Stratus computer. What was required took some considerable time to ascertain and involved investigations by the manufacturer and Olivetti as well as by Mr Purdy. It was Mr Purdy who eventually designed the software which was incorporated into the computer to become part of its firmware. The remaining part of the problem with the communication between the Stratus computer and the personal computers was related to the speed of communication. That was solved by replacing the personal computers by others bought from Olivetti.

34. The problem of the communications between the personal computers and the equipment which they controlled was caused by the inadequacy of the circuit boards, which had been bought commercially and installed at the interface between the personal computers and the equipment. They had to be replaced by other circuit boards; those were also bought commercially. Then modifications had to be made to the firmware of the new circuit boards. When those problems had been solved by Mr Purdy, the PTS was operating successfully; it has continued to do so.

35. The process of creating firmware is to design appropriate software and then to install it in the computer or the circuit board in such a way that it becomes an integral part of it so that, unlike functions performed by software, the functions performed by the firmware are not lost if there is a breakdown of the computer. The actual installation of firmware is a relatively simple, routine task; the difficult task is to design the appropriate software to solve the problem which has given rise to the need for the creation of the firmware.

36. For the activities undertaken by the applicant and its employees in designing and implementing the PTS to be research and development activities as that expression is defined in section 73B(1) of the Assessment Act, the activities must be systematic, investigative or experimental. Mr Ginnane conceded that they were systematic. We are satisfied that that concession was properly made. However, the activities must also involve innovation or technical risk. Mr Ginnane submitted that they did not do so. In making that submission he relied strongly on the evidence given by Professor Peterson.

37. Professor Peterson gave evidence that he holds a Ph.D. degree of Sydney University in electrical engineering, that from 1978 he was a senior lecturer, and is now an Associate Professor, in computer systems engineering at what is now the University of Technology, Sydney, and that he worked before 1978 in Holland and in 1984 in Australia for firms engaged in the automation of industrial processes, his own work having involved the application of computer technology to such

projects. He gave evidence that he had been involved in the design of computer integrated manufacturing systems of which production tracking systems had formed one component. He amply satisfied us of his expertise both in relation to the state of computer technology in the mid 1980s and in particular in respect of the application of that technology at that time in industry for the purpose of monitoring and controlling the manufacture of goods.

38. Professor Peterson tendered in evidence extracts from a textbook on Software Engineering Economics which summarized in structured detail the various steps that should be followed in the product development of a computer system. He said that the book was published in 1981 and that in the early 1980s the steps described in it were very widely accepted as correct. Those steps were first the analysis phase, where essentially the problem to be solved was analyzed. Next, after the analysis was completed, came the preparation of the system requirement specification document, that is to say the writing down of exactly what the system was required to do. After that came the design phase within which there were two branches. The first one was to state the hardware needed; the other was to design the software required. When the design was finished, the software modules and the hardware configuration were specified. Finally, there was the implementation stage; that was completed by the integration and testing of the hardware and software components. Having visited the Burnie mill twice to inspect the PTS there and having heard the evidence of all the applicant's witnesses in these proceedings, Professor Peterson said that the applicant's employees had essentially followed all the steps generally recognized in the early 1980s as those required to be followed if one wanted to install a PTS.

39. As we have stated above, the computers were commercially available and were bought from Olivetti. The converters were designed by Mr Brookes; there is no dispute that to create them he applied in a professional manner the appropriate publicly known technology. The use of telephone cable, although possibly less than ideal for the environment of the factory, accorded with common practice in the adoption of the RS-422 standard. The modifications to the Stratus computer and to the circuit boards at the back of some of the personal computers all involved essentially the design of appropriate software and then the use of commercially available components to incorporate it as firmware.

40. In the Macquarie Dictionary (2nd Edition) "innovation" is said to mean "something new or different introduced; the act of innovating; introducing of new things or methods". "Innovate" is stated to mean "to bring in something new; make changes in anything established; to bring in (something new) for the first time". In the Shorter Oxford English Dictionary the meaning of "innovation" is stated as "the action of innovating; the introduction of novelties; the alteration of what is established by the introduction of new elements or forms". The meaning of "innovate", used intransitively, is given as "to bring in or introduce novelties; to make changes in something established; to introduce innovations".

41. Mr Murphy submitted that the provision contained in paragraph (a)(ii) of the definition of "research and development activities" was ambiguous or obscure and that section 15AB of the Acts Interpretation Act 1901 authorized resort to the explanatory memorandum and the second-reading speeches relating to the 1986 amending Act. Mr Ginnane did not make any submission on that matter but addressed the content of the explanatory memorandum and the second-reading speeches. In our view, when paragraph (a)(ii) is read in the context of section 73B, there is no ambiguity or obscurity. However, in deference to the submissions made by both Counsel regarding the explanatory memorandum and the second-reading speeches, we shall refer briefly to those materials.

42. In the explanatory memorandum the definition of "research and development activities" is explained. The explanation includes the following passage:-

"The reference to innovation or technical risk pertains to work elements that are primarily experimental in nature, are innovative, involve substantial risk, and are essential to attaining the primary objective.

A basic criterion associated with determination of 'innovation' is the presence of an appreciable element of novelty. This may be assessed according to several criteria, including whether -

- . the work is seeking previously undiscovered phenomena, structures or relationships
- . the work is attempting to apply knowledge or techniques in a new way;
- . the outcomes are likely to benefit more than one organisation; or
- . the results are expected to be patentable.

'Technical risk' addresses the principle of uncertainty. This requires that the probability of obtaining a given technical objective cannot be known or determined in advance on the basis of current knowledge or experience - that is, the outcome cannot be predicted with certainty. The technological or scientific uncertainty can only be removed through a program of systematic investigation, experimentation and analysis."

43. In the second-reading speeches the specific objectives of the proposed tax concession were stated as follows:-

- "to provide an incentive for greater levels of R & D in Australia;
- to concentrate new R & D efforts in industry by greater business investment in, and responsibility for, R & D;
- to provide positive support for R & D activities in industry on the basis that significant benefits accrue to both industry and

the wider community through enhanced competitiveness of industry;
to provide mechanisms for encouraging effective use of Australia's existing R & D expertise;
to encourage a capacity in industry to be aware of, and exploit, technological developments occurring in other countries."

44. In the Senate the speech contained also the following passages:-

"The definition of eligible research and development activities was formulated after extensive consultation with industry, the scientific community and the Australian accounting profession. It is based on the definition of R & D used by the OECD and the Australian Bureau of Statistics. It closely resembles the definition used by the Canadian Government which operates a taxation concession scheme with similar features to this proposed concession.

.....

The central definition of research and development means activities of a systematic, investigative or experimental nature, involving innovation or technical risk undertaken for the purpose of acquiring new knowledge or for creating new or improved materials, products, processes or services. It thus encompasses each of the elements of basic research, applied research and experimental development, which are explained in greater detail in the Explanatory Memorandum that will be made available to Honourable Senators.

The definition also includes other activities undertaken in direct support of activities falling within the central definition. These include (but are not limited to) industrial design, engineering design, production engineering, operations research, mathematical modelling and analysis, psychological research and computer software development.

.....

The Bill excludes a number of activities that are not systematic, investigative or experimental activities involving innovation or technical risk. These include market research, market testing, quality control, cosmetic modifications or stylistic changes and management studies. Other activities not specifically identified in the Bill but which fall outside the definition are:

Pre-production activities such as demonstration of commercial viability, tooling-up, trial and production runs;
routine data collection;
preparing for teaching;

costs of patenting or copywriting the results of R & D work;
specialised routine medical care;
duplication of commercial products or processes."

45. Mr Ginnane tendered in evidence a copy of the Frascati Manual, which contains the definition of "research and development" used by the OECD, to which reference was made in the second-reading speech in the Senate. At page 28 of the manual the basic criterion for distinguishing research and development from related activities is stated to be "the presence in R & D of an appreciable element of novelty". That, no doubt, is what is intended by the phrase "involve innovation" in section 73B(1).

46. So far as the hardware of the PTS is concerned, the activities undertaken by the applicant did not, we are satisfied, involve innovation. Certainly, the Stratus computer and personal computers had not been used in a production tracking system in a paper mill. However, there is evidence before the Tribunal that for a considerable time before 1979 computers had been used in the pulp and paper industry for process control; they had been used for that purpose at the Burnie mill for some years before 1985. Before 1985 computers had been used in several industries in Australia for computer integrated manufacturing systems, which included production tracking systems. Essentially all that the applicant did was to select existing commercially available computers that would meet the requirements of its PTS. We are satisfied that the fact that the particular computers, if the applicant's rather limited enquiries are relied on, had not previously been used for a production tracking system in a paper mill did not have the effect that the applicant's activities involved innovation.

47. So far as the manufacture of the converters was concerned, the technology utilized was well established and the product was essentially the same as the converter boxes available commercially, with one component omitted. Again, we are satisfied that the design and installation of those converters did not constitute activities involving innovation. It is probable that the designing and development of the software by Mr McLennan was an activity involving innovation. However, the software was developed otherwise than for the purpose of sale, rent, licence, hire or lease. As a consequence, although the activities were in fact systematic activities, section 73B(2)(g) and 73B(2A) require that they be taken not to be systematic, investigative or experimental activities and so not research and development activities.

48. So far as technical risk is concerned, Professor Peterson gave evidence that in his opinion, provided that the persons engaged in designing and installing the PTS at the Burnie mill were competent, there was never any risk of the project not being successfully implemented. The only risks in his opinion were that it might cost more than was estimated and that it might take longer to implement than was forecast. Having heard the evidence of the applicant's witnesses as to the manner in which the PTS was designed and implemented, we are satisfied that there was no

technical risk, that is to say there was no technological uncertainty about the outcome.

49. Mr Murphy submitted that the project taken as a whole constituted activities that involved innovation because, although all of the technology which was used to design and implement the PTS was a matter of public knowledge and although production tracking systems had been developed in other industrial environments, the technology was applied to the development of a PTS in a paper mill. There are, we think, two short answers to that submission. The first is that the applicant had itself developed a PTS at its Shoalhaven mill before 1985. Although it was not as extensive a system as the PTS which was installed at the Burnie mill, and although the computers were different and the design of the communication link between the central computer and the terminals was different, it performed essentially the major function of the PTS in the Burnie mill, that is to say the function of an information system. The second answer is that the use of existing technology to operate what is essentially an information system of the same type as that installed in a number of other industrial environments is not innovative simply because it is installed in a new environment. There must be some development of the technology or a new use of existing technology for an activity to involve innovation.

50. For the reasons which we have stated above we have come to the conclusion that the applicant's activities in designing and implementing the PTS were not research and development activities for the purposes of section 73B of the Assessment Act. Mr Ginnane submitted that a similar conclusion could be reached in respect of at least some of the activities by reason that section 73B(2) required that they be taken not to be systematic, investigative or experimental activities. He submitted that some of the activities were carried on by way of quality control and efficiency surveys. In view of the conclusion which we have reached that the activities did not involve innovation or technical risk, that is a matter which it is not necessary for us to decide.

51. As the activities engaged in by the applicant and its employees in respect of the PTS at the Burnie mill were not research and development activities for the purposes of section 73B of the Assessment Act, we have affirmed the decision under review.