

PATENTING HEALTH-RELATED DATABASES AND INFORMATION IN AUSTRALIA

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Summary

Central to an assessment about how health-related databases should be regulated is the potential to commodify databases and the information in those databases through intellectual property, and in particular, patents for inventions under the *Patents Act 1990* (Cth). Patents potentially provide more comprehensive property-like privileges over databases than copyright. In particular, patents have the potential to control the use and re-use of information, prevent independent invention and re-engineering of databases and have no 'fair use' exemption. In these circumstances a patent may be more desirable to those creating and exploiting databases, while posing more significant restrictions on access and use of the database information. This article investigates the possibility of patenting computer-based databases and the information in those databases and concludes that there is considerable potential for patents to apply to both databases (data structures and software), and in some cases the information *per se* in those databases. This conclusion suggests that the role of patents needs to be taken into account when considering the possible regulation of computer-based health-related databases.

1. Introduction

In general terms a database is a collection of entries arranged in a systematic or methodical way and individually accessible by electronic or other means.² In the context of human health, databases may include tissue samples from which genetic information may be obtained or derived (such as a Guthrie Card blood spot), records from which an inference may be drawn (such as a record of cancer risk from a recording of parental incidence of the disease), the results from research experiments relating to humans, disparate health-related information that might be correlated to assist a diagnosis, and so on. The amount and content of entries about individuals, and inferentially about their relatives, is expanding exponentially with ever-increasing potential to apply systematically those

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2 See for example Directive 96/9/EC on the Legal Protection of Databases [1996] *Official Journal of the European Community (L Series)* 028/11/EC (Database Directive) art 1(2).

collected and compiled entries for health-related benefits for individuals and their families. In almost every circumstance however, the collected entries about an individual's health are being reduced to various databases containing machine-readable codes that may be created, stored and processed through computers. The critical question is: should, and if so, how should, those databases be regulated? Central to this assessment is the potential to commodify the databases and the information in those databases through intellectual property, and in particular, patents for inventions under the *Patents Act 1990* (Cth).

This article is only concerned with *Patents Act 1990* (Cth) 'inventions' implemented in a computer and employing a computer-readable media.³ This is further distinguished between hardware inventions and software inventions, the former being readily patentable,⁴ while the latter's patentability has been contentious since the 1950s on the basis that most computer software was considered to be merely an abstract idea, an algorithm, a mental step or printed matter, and so unpatentable.⁵ However, developments in the last decade show that the boundaries of patentability for inventions implemented in a computer or employing computer-readable media are expanding.⁶ This in part reflects the increasing powers of computers to collect, compile, store, retrieve and process data and information more efficiently and effectively, and in many cases perform tasks not otherwise possible.⁷ This is particularly true of the so-called 'omic' revolution of genomics, proteomics, phenomics, epigenomics, ligandomics, and so on, 'with increasing volumes of molecular data added to ballooning databases'⁸ and then the

3 The term 'invention' is used in the sense of an 'invention' for which a patent may be granted under the *Patents Act 1990* (Cth) s 18; the term 'invention' in the context of the *Patents Act 1990* (Cth) s 40(2) means 'the embodiment which is described, and around which the claims are drawn': *Kimberly-Clark Australia Pty Ltd v Arico Trading International Pty Ltd* (2001) 207 CLR 1, 15 (Gleeson CJ, McHugh, Gummow, Hayne and Callinan JJ).

4 See IP Australia, 'Patents for Computer Related Inventions' at <http://www.ipaustralia.gov.au/pdfs/patents/specific/computer.pdf> (viewed 1 February 2005).

5 There is a considerable literature about these developments; good recent examples setting out some of the developments include Daniel Attridge, 'Challenging Claims! Patenting Computer Programs in Europe and the USA' (2001) *Intellectual Property Quarterly* 22; Andrew Christie and Serena Syme, 'Patents for Algorithms in Australia' (1998) 20 *Sydney Law Review* 517.

6 See Jonathan Newman, 'The Patentability of Computer Related Inventions in Europe' (1997) *European Intellectual Property Review* 701; Sam Ricketson, 'Business Method Patents: A Matter of Convenience?' (2003) 2 *Intellectual Property Quarterly* 97.

7 For an overview of some of the relevant technological developments see Charles Vorndran and Robert Florence, 'Bioinformatics: Patenting the Bridge Between Information Technology and the Life Sciences' (2003) 42 *IDEA* 93, 94-107.

8 See Glen Evans, 'Designer Science and the "Omic" Revolution' (2000) 18 *Nature Biotechnology* 127.

synthesis of this information into systematic and functional networks.⁹ The significance of these developments is the manipulation of the information in the databases using computers (the data structures and software), and then the manipulation, compiling and correlation of information itself within these computer-based databases (the information *per se*).

Concerns about the regulation of databases have been reflected in emerging regulatory schemes in Europe, the United States and Australia to deal with privacy, discrimination, research, and so on,¹⁰ including the evolution of intellectual property schemes.¹¹ In Europe, the Database Directive expressly protects the contents of a database¹² applying copyright to original databases (new selections and arrangements) and a *sui generis* right for non-original databases (collection and verification).¹³ There are express exemptions for extractions for a 'private purpose' and teaching and non-commercial research,¹⁴ although the *sui generis* right is confined to European Union nationals and firms with their principal place of business in the European Union.¹⁵ The United States does not have such a database right, instead relying on copyright to protect data compilations with a threshold element of creativity,¹⁶ with other data compilations relying on contract and trade secret.¹⁷ In Australia, most attention has focussed on the protection of data compilations under copyright where, unlike in the United States, there is no requirement for creativity, so that any data compilations may be protected.¹⁸

However, patents under the *Patents Act 1990* (Cth) potentially provide more comprehensive property-like privileges than copyright and other database

9 See for examples Melanie Mayer and Philip Hieter, 'Protein Networks – Built by Association' (2000) 18 *Nature Biotechnology* 1242; Minoru Kanehisa and Peer Bork, 'Bioinformatics in the Post-sequence Era' (2003) 33 *Nature Genetics* 305.

10 See generally Australian Law Reform Commission, *Essentially Yours: The Protection of Human Genetic Information in Australia*, ALRC 96 (2003).

11 See generally Australian Law Reform Commission, *Genes and Ingenuity: Gene Patenting and Human Health*, ALRC 99 (2004).

12 Database Directive, above n 1, art 1.

13 Database Directive, *ibid* arts 3-11; for an overview of the Database Directive, *ibid* n 1, see Lionel Bently and Brad Sherman, *Intellectual Property* (2004) 297-305.

14 Database Directive, above n 1, art 9.

15 Database Directive, *ibid* art 11(2).

16 See *Feist Publications Inc v Rural Telephone Service Inc* 499 US 340 (1991).

17 For example, Human Genome Sciences Inc, Incyte and Celera maintain trade secret protected databases of DNA sequence information that may be used according to contracts: see Matthew Rimmer, 'Beyond Blue Gene: Intellectual Property and Bioinformatics' (2003) 34 *International Review of Industrial Property and Copyright Law* 31.

18 See *Telstra v Desktop Marketing Systems* (2001) 51 IPR 257 (Finkelstein J); for a recent review of the relevant Australian laws see Australian Law Reform Commission, above n 10, 633-659; see also Rimmer, *ibid* 35; Maree Sainsbury, 'Databases and Copyright – Finding the Match' (2001) *Digital Technology Law Journal* 3, [17]-[52].

privileges. In particular, patents have the potential to control the use and re-use of information, prevent independent invention and re-engineering of databases and have no 'fair use' exemption. In these circumstances a patent may be more desirable to those creating and exploiting databases,¹⁹ while posing more significant restrictions on access and use of the database. This article investigates the possibility of patenting databases and the information *per se* making up those databases and suggest that there are few limits on the potential of patent law evolving to capture these inventions depending on the way they are characterised.

Significantly, the international minimum patent standards required by the World Trade Organisation's *Agreement on Trade Related Aspects of Intellectual Property Rights* (TRIPs)²⁰ do not set out any restrictions on patenting databases and information *per se*. The minimum patenting standards required by TRIPs are only that 'patents shall be available for any inventions, whether products or processes, in all fields of technology, provided that they are new, involve an inventive step and are capable of industrial application'.²¹ Further 'patents shall be available and patent rights enjoyable without discrimination as to the place of invention, the field of technology and whether products are imported or locally produced'.²² In Australia, TRIPs' threshold standards have been articulated in the *Patents Act 1990* (Cth) by requiring an 'invention'²³ that is a 'manner of manufacture',²⁴ that is useful,²⁵ novel,²⁶ involves an inventive step²⁷ and satisfies

19 Noting that some commentators have asserted that 'if patent protection were provided to the database ... advances in technology would be facilitated, business would benefit and the valuable database itself would be disseminated more quickly into the public domain, thus preventing unnecessary research duplication': Robert Sterne and Lawrence Bugaisky, 'The Expansion of Statutory Subject Matter Under the 1952 Patent Act' (2004) 37 *Akron Law Review* 217, 226-227; see also Amol Pachnanda, 'Scientific Databases Should be Protected Under a Sui Generis Regime' (2003) 51 *Buffalo Law Review* 219.

20 *Marrakech Agreement Establishing the World Trade Organisation* [1995] ATS 8, Annex 1C (TRIPs).

21 TRIPs art 27(1): noting that the terms 'inventive step' and 'capable of industrial application' are equivalent to the terms 'non-obvious' and 'useful' respectively.

22 TRIPs art 27(1); the only allowable exclusions are 'inventions ... necessary to protect *ordre public* or morality, including to protect human, animal or plant life or health or to avoid serious prejudice to the environment' (TRIPs art 27(2)), 'diagnostic, therapeutic and surgical methods for the treatment of humans or animals' (TRIPs art 27(3)(a)) and 'plants and animals other than micro-organisms, and essential biological processes for the production of plants or animals other than non-biological and microbiological processes' (TRIPs art 27(3)(b)).

23 *Patents Act 1990* (Cth) s 18(1); the term 'invention' is defined to mean 'any manner of new manufacture the subject of letters patent and grant of privilege within section 6 of the *Statute of Monopolies*, and includes an alleged invention': *Patents Act 1990* (Cth) sch 1.

24 Being 'a manner of manufacture within the meaning of s6 of the *Statute of Monopolies*': *Patents Act 1990* (Cth) s 18(1)(a).

25 *Patents Act 1990* (Cth) s 18(1)(c).

the formal requirements of definition and description.²⁸ There are no express exemptions for databases or information *per se* under the *Patents Act 1990* (Cth), the current scheme may only exclude these subject matters on the basis of the generally applicable principles.

This article examines in Part 2 the potential to patent the manipulation of databases (the data structures and software). The analysis suggests that patents are available where the collections of information *per se* stored and accessed from a database using a computer can be characterised as a technical apparatus or machine with invention lying in both the process of storing and analysing the information and the product or process of the invention being the accessed information itself that might be used for an industrial purpose. Part 3 examines the patenting over the information *per se* making up those databases to show that some uncertainty still remains in distinguishing between what is and what is not patentable information *per se*. Again this depends on characterising the information *per se* as part of a product or process that has an industrial purpose. Part 4 then sets out the conclusions that databases (the data structures and software) and the information *per se* making up those databases are potentially patentable in Australia, and that patentability should probably be a relevant consideration when assessing the emerging regulation of health-related information in computer-based databases.

2. Patenting databases (the data structures and software)

Over time patent laws have grappled with distinguishing between what should be a patentable invention and what should be excluded for various legal, cultural, social and political concerns.²⁹ These concerns are reflected in the modern requirement that the subject matter of the 'invention'³⁰ be 'any manner of new manufacture the subject of letters patent and grant of privilege within s6 of the *Statute of Monopolies*',³¹ and 'so far as claimed in any claim ... is a manner of manufacture within the meaning of s 6 of the *Statute of Monopolies*',³² These terms include the body of law that has evolved through the use of this term in the common law and previous and current legislation,³³ although notably, this is a

26 *Patents Act 1990* (Cth) s 18(1)(b)(i).

27 *Patents Act 1990* (Cth) s 18(1)(b)(ii).

28 *Patents Act 1990* (Cth) ss 42(2) and (3).

29 See Bently and Sherman, above n 12, 384.

30 *Patents Act 1990* (Cth) s 18(1).

31 *Patents Act 1990* (Cth) sch 1.

32 *Patents Act 1990* (Cth) s 18(1)(a); the element of 'newness' probably has a very narrow application and probably only applies where novelty and inventive step are expressly not in issue: see Charles Lawson, 'Patenting Genes and Gene Sequences and Competition: Patenting the Expense of Competition' (2002) 30 *Federal Law Review* 97, 105-108.

33 See for example Lawson, *ibid* 103-109.

concept rather than a strict application of the words.³⁴ As a generalisation, the courts have increased the scope of patentable subject matter,³⁵ so that the focus has moved from deciding whether an alleged invention is one of the excluded subject matters to being '[i]s this a proper subject of letters patent according to the principles which have been developed for the application of s 6 of the *Statute of Monopolies*?³⁶ Thus, the acceptable subject matter of an invention is now 'of such a wide, elastic and amorphous character as to cover almost all newly-created subject matters or processes'.³⁷

However, as a generalisation, the Australian patent law has maintained a distinction that abstract concepts and applications that are not 'manufactures' are not patentable because by themselves they have no practical application (being a discovery at best),³⁸ or belong to the 'useful arts'.³⁹ These unpatentable abstract

34 *National Research Development Corp v Commissioner of Patents* (1959) 102 CLR 252, 269 (Dixon CJ, Kitto and Windeyer JJ); see also Industrial Property Advisory Committee, *Patents, Innovation and Competition in Australia* (1984) 40.

35 Some commentators now argue that the test is so broad that any practical restriction has been 'annihilated': see Andrew Christie, 'Some Observations on the Requirement of Inherent Patentability in the Context of Business Method Patents' (2000) 41 IP Forum 16.

36 *National Research Development Corp v Commissioner of Patents*, above n 33, 269 (Dixon CJ, Kitto and Windeyer JJ); see also *CCOM Pty Ltd v Jiejing Pty Ltd* (1994) 28 IPR 481, 514 (Spender, Gummow and Heerey JJ); *Welcome Real-Time SA v Catuity Inc* (2001) 51 IPR 327, 352 (Heerey J); IP Australia, 'Patents for Computer Related Inventions' at <http://www.ipaustralia.gov.au/pdfs/patents/specific/computer.pdf> (viewed 1 February 2005); see also IP Australia, 'Patents for Business Schemes' at <http://www.ipaustralia.gov.au/pdfs/patents/specific/schemes.pdf> (viewed 1 February 2005).

37 J Starke, 'The Patenting of Animal Forms with New Traits' (1987) 61 *Australian Law Journal* 324, 325-326; see also Australian Patent Office, *Manual of Practice and Procedure* (2003) [8.2.5.1] (Vol 2); however, there may be still be some unpatentable subject matters – a delegate of the Commissioner of Patents in *Stephen John Grant's Application* [2004] APO 11 (26 May 2004) considered a method of protecting assets against a loss of ownership as a result of a legal liability by securing a charge over assets through a trust or mortgage arrangement finding it was not a 'manner of new manufacture' as the alleged invention did not result in 'an artificially created state of affairs – the state of affairs was already present in the laws of Australia' ([28]). The delegate's justification for rejecting the claim against the assertion that 'the present method creates an artificial state of affairs, and is clearly of economic utility in practical affairs' ([19]) was to find that even though there was 'economic utility' ([21]), there was 'a discovery in relation to the laws of Australia, useful in the affairs of the populace' but there was 'no new law of nature, and there is no application of technology (in the broadest possible sense of the word) to implement the method of the invention' ([25]).

38 See for example *National Research Development Corp v Commissioner of Patents*, above n 33, 264 (Dixon CJ, Kitto and Windeyer JJ).

concepts and applications that are not ‘manufactures’ have included the fine arts, discoveries, ideas, scientific theories, schemes and plans, laws of nature, mathematical algorithms, printed matter, mere working directions, and so on.⁴⁰ However, this distinction between the abstract concepts and applications that are not ‘manufactures’ and an industrial requirement is increasingly breaking down where the abstract concept or application that is not a ‘manufacture’ itself forms part of the product or process of the invention.⁴¹ Thus, the manipulations of collections of information *per se* stored and accessed from a database using a computer might be characterised as a technical apparatus or machine with invention lying in both the process of storing and analysing the information and the product or process of the invention being the accessed information itself that might be used for an industrial purpose. The following cases illustrate this contention and show that similar issues are apparent in the United States and the European Union, although the reasoning underlying decisions accepting this approach to patenting may not be exactly the same.

In Australia, in *CCOM Pty Ltd v Jiejing Pty Ltd*,⁴² the Full Federal Court considered an invention that used word processing to assemble text in Chinese language characters by selecting and retrieving graphic representations of desired characters from a database of stroke-type categories of characters.⁴³ There the Full Federal Court applied the principle from *National Research Development Corp v Commissioner of Patents*,⁴⁴ as requiring ‘a decision as to what properly and currently falls within the scope of the patent system’,⁴⁵ being ‘a mode or manner of achieving an end result which is an artificially created state of affairs of utility in the field of economic endeavour’.⁴⁶ On the facts of this case, the justices concluded that the computer processing apparatus claimed in the patent resulted in a

39 See for example *Virginia-Carolina Chemical Corporation’s Application* [1958] RPC 35, 36 (Lloyd-Jacob J); see also *British Petroleum Co Ltd’s Application* (1968) 38 AOJP 1020; *Application of NV Phillips Gloeilampenfabrieken* (1966) 36 AOJP 2392.

40 For an overview see Australian Patent Office, *Manual of Practice and Procedure*, above n 36, [8.2.4]-[8.2.17] (Vol 2)

41 See for example *Ciba-Geigy (Durr’s) Applications* [1977] RPC 83 where Justice Graham in the Patents Appeals Tribunal appears to reason that if instructions in words on a package about how to use a product can be said to modify or qualify the package for a useful purpose, then there might be a ‘manner of new manufacture’ (87), and in agreement, in the Court of Appeal, Lord Justice Russell appears to consider that information in writing on a container that interacts with the contents of the container might be patentable (89); see also *Nelson’s Application* [1980] RPC 173 (Whitford J).

42 *CCOM Pty Ltd v Jiejing Pty Ltd*, above n 35 (Spender, Gummow and Heerey JJ).

43 *Ibid* 514 (Spender, Gummow and Heerey JJ).

44 Above n 33, 275 (Dixon CJ, Kitto and Windeyer JJ).

45 *CCOM Pty Ltd v Jiejing Pty Ltd*, above n 35, 511 (Spender, Gummow and Heerey JJ).

46 *Ibid* 514 (Spender, Gummow and Heerey JJ).

product⁴⁷ that was useful and in a field of economic endeavour, and was therefore a ‘manner of manufacture’.⁴⁸ The invention was thus characterised as a method applied to an apparatus:

What one might call ‘the idea’ of the invention lies in the use of a particular method of characterisation of character strokes which is applied to an apparatus in such a way that operation of the keyboard will enable the selection through the computer, in a particular way, of the appropriate Chinese characters required for word processing.⁴⁹

In effect, however, the patent claimed a database of stroke-type categories of characters that used an algorithm to assemble characters from that database. Perhaps significantly, the claim was drafted in the form of an apparatus claim rather than a method claim, with claim 1 providing:

Computer processing apparatus for assembling text in Chinese language characters, said computer processing apparatus including: a memory including character stroke data storage means which stores data relevant to Chinese character stroke-type categories, Chinese characters and the order in which character strokes of respective Chinese characters are written and complementary graphic data storage means from which data relevant to the graphic representations of each said Chinese character may be retrieved ...⁵⁰

In finding this claim a suitable subject matter for patenting, the Full Federal Court overturned the primary decision where the invention had been characterised as a database of information that used conventional computer functions.⁵¹ Based on expert evidence the trial judge in rejecting the claim concluded that the database was the result of a ‘linguistic exercise’ deconstructing the arrangement and order of characters that was nothing more than storing the results of a mental or artistic exercise.⁵² Further, the trial judge considered the computer was merely ‘operating in a conventional way with conventional programs to reproduce the mental process’.⁵³ The significance of the Full Federal Court’s decision therefore appears to be distinguishing between a patentable

47 [T]he use of word processing to assemble text in Chinese language characters’: *CCOM Pty Ltd v Jiejing Pty Ltd*, *ibid* 514 (Spender, Gummow, Heerey JJ); interestingly, in their conclusions the Full Federal Court used the terms ‘artificially created state of affairs’ (514) but use the terms ‘every end produced or artificially created state of affairs’ (511) when articulating the consequence of the *National Research Development Corp v Commissioner of Patents* decision: *CCOM Pty Ltd v Jiejing Pty Ltd*, *ibid* 511 and 514 (Spender, Gummow and Heerey JJ).

48 *CCOM Pty Ltd v Jiejing Pty Ltd*, *ibid* 514-515 (Spender, Gummow and Heerey JJ).

49 *Ibid* 507 (Spender, Gummow and Heerey JJ).

50 *Ibid* 490 (Spender, Gummow and Heerey JJ).

51 *CCOM Pty Ltd v Jiejing Pty Ltd* (1993) 27 IPR 577, 592-593 (Cooper J).

52 *Ibid* 593 (Cooper J).

53 *Ibid* 593 (Cooper J).

apparatus and a mere unpatentable method, the apparatus being the database applied through a computer system to produce a product, thereby passing the threshold for patentable subject matter.

In other decisions, the Australian courts also appear to make a similar distinction between a mere unpatentable method and a patentable apparatus applying the method. Thus, in *International Business Machines Corp v Commissioner of Patents*⁵⁴ the Federal Court found that a mathematical formula used to produce an improved curved image (a method and apparatus for generating computer graphics displays) that was commercially useful was patentable subject matter: 'the formula is applied to achieve an end, the production of the improved curve image. A method of producing that by computer, which is novel and inventive, is entitled to the protection of the patent laws'.⁵⁵ Then in *Welcome Real-Time SA v Catuity Inc*,⁵⁶ the Federal Court concluded that a process and device to operate smart cards for traders' loyalty programs was patentable. This conclusion expressly rejected the applicant's argument that 'the patent was no more than a method or system for using well known integers – a chip card, the memory space on that card, various computer programs, readers and printers – to operate familiar kinds of loyalty and incentive schemes for customers'.⁵⁷ The Federal Court reasoned that there was more than just an 'abstract idea' or 'method of calculation' as 'cards can be issued making available to consumers many different loyalty programs of different traders as well as different programs offered by the same trader. All this can be done instantaneously at each retail outlet'.⁵⁸ This was thus a method and an apparatus for use in business and so was a suitable subject matter for a patent.

This authority is consistent with developments in the United States and the Europe Union where there is a similar exclusion of certain non-practical and non-technical subject matters.⁵⁹ In the United States the subject matter must be a new and useful improvement of a process, machine, manufacture or apparatus, or composition of matter.⁶⁰ Thus, in *State Street Bank & Trust Co v Signature Financial Group*⁶¹ the United States Court of Appeals for the Federal Circuit held that transforming data through a series of mathematical calculations was a practical application of a mathematical algorithm that produced 'a useful, concrete

54 (1991) 22 IPR 417 (Burchett J).

55 *International Business Machines Corporation v Commissioner*, *ibid* 425 (Burchett J).

56 Above n 35 (Heerey J).

57 *Ibid* 349 (Heerey J).

58 *Ibid* 353 (Heerey J).

59 United States: 35 USC § 101; Europe: *European Patent Convention* art 52.

60 35 USC § 101 provides that patentable subject matter as being a 'process, machine, manufacture [apparatus], or composition of matter, or any new and useful improvement thereof.

61 149 F.3d 1368 (1998) (Rich, Plager and Bryson JJ); *certificate denied* 525 US 1093 (1999).

and tangible result' and was therefore patentable.⁶² This approach was confirmed in the later decision in *AT&T Corp v Excel Communications Inc*,⁶³ where the United States Court of Appeals for the Federal Circuit found a patent for an invention that added telephone user information to a database using a mathematical algorithm (data gathering) that could then be used to apply appropriate user charges to telephone users was patentable subject matter.⁶⁴ The invention claimed:

A method for use in a telecommunications system in which inter-exchange calls initiated by each subscriber are automatically routed over the facilities of a particular one of a plurality of inter-exchange carriers associated with that subscriber, said method comprising the steps of: generating a message record for an inter-exchange call between an originating subscriber and a terminating subscriber, and including, in said message record, a primary inter-exchange carrier (PIC) indicator having a value which is a function of whether or not the inter-exchange carrier associated with said terminating subscriber is a predetermined one of said inter-exchange carriers.⁶⁵

The lower court, the United States District Court for the District of Delaware, had found the patent invalid for want of subject matter on the basis that it was a method using switches and computers to make a 'non-substantive change' in the data's format and that this did not convert non-patentable subject matter into patentable subject matter.⁶⁶ In effect the invention was a way to add new information to an existing long distance telephone billing system database so that a differential billing rate could be applied to different long distance telephone subscribers using different telephone networks to connect.⁶⁷ On appeal the invention was characterised as using a well known method merely to add extra information to an existing database.⁶⁸ On appeal this was rejected on the basis that the added information was 'a useful, non-abstract result that facilitates differential billing of long-distance calls' and that the claimed process produced 'a useful, concrete, tangible result without pre-empting other uses of the mathematical principle, on its face the claimed process comfortably falls within the scope' of suitable subject matter.⁶⁹ Thus, suitable subject matter includes an

62 *State Street Bank & Trust Co v Signature Financial Group*, *ibid* 1373 (1998) (Rich J); this decision was cited with approval in *Welcome Real-Time SA v Catuity Inc*, *above n* 35, 353 (Heerey J).

63 172 F.3d 1352 (1999) (Plager, Clevenger, and Rader JJ); *certificate denied* 528 US 946 (1999).

64 *AT&T Corp v Excel Communications Inc*, *ibid* 1359-1360 (Plager J).

65 *Ibid* 1354 (Plager J).

66 See *AT&T Corp v Excel Communications Inc* 1998 WL 175878, 6-7 (District of Delaware 1998) (Robinson J).

67 See *AT&T Corp v Excel Communications Inc*, *above n* 62, 1353-1354 (Plager J).

68 *Ibid* 1358 (Plager J).

69 *Ibid* 1358 (Plager J).

algorithm or process manipulating information ‘applied in a practical manner to produce a useful result’.⁷⁰

In the Europe Union, the subject matter exclusions are more clearly articulated in the *European Patent Convention* expressly excluding mathematical methods, schemes, rules or methods for performing a mental act, playing a game or doing business, computer programs and the presentation of information ‘as such’.⁷¹ However, in applying this provision, the Technical Board of Appeal in *Controlling pension benefits system/PBS PARTNERSHIP*⁷² found that apparatus claims for a computer-controlled pension benefits system that stored and processed information were patentable,⁷³ while method claims for merely controlling the system were unpatentable business methods.⁷⁴ In effect these were claims to a bare business method/scheme implemented on a computer. That the method operated on a computer was not enough to render the required ‘technical character’.⁷⁵ There was an express requirement for some form of technical contribution⁷⁶ with ‘[a]rguments or facts which indicate that the individual steps

70 Ibid 1360 (Plager J).

71 *European Patent Convention* art 52 provides that the ‘following in particular shall not be regarded as inventions within the meaning of [any inventions which are susceptible of industrial application, which are new and which involve an inventive step]: (a) discoveries, scientific theories and mathematical methods; (b) aesthetic creations; (c) schemes, rules and methods for performing mental acts, playing games or doing business, and programs for computers; (d) presentations of information ... only to the extent to which a European patent application ... relates to such subject-matter or activities as such’.

72 T931/95 [2001] *Official Journal of the European Patent Office* 441; noting that the Board expressly rejected the ‘contribution approach’ to assessing subject matter exclusions saying that there ‘is no basis in the EPC for applying this so-called contribution approach’ (454); how the various member states of the European Union will apply the decision in *Controlling Pension Benefits System/PBS PARTNERSHIP* remains uncertain as, for example, in England the Patent Office has recognised the effect of that decision, but declined to follow it in favour of existing decisions in England favoring substance over form in the patent claims: see *R v Hutchins’ Application* [2002] RPC 8 (Stephen Probert).

73 *Controlling Pension Benefits System/PBS PARTNERSHIP*, ibid 451-453.

74 Ibid 449-451; noting the probably significant characterization of the method as lacking a technical character, being ‘the individual steps defining the claimed method amount to no more than the general teaching to use data processing means for processing or providing information of purely administrative, actuarial and/or financial character, the purpose of each single step and of the method as a whole being a purely economic one.’ (449-450).

75 Ibid 450; such that ‘an invention may be an invention within the meaning of art 52(1) if for example a technical effect is achieved by the invention or if technical considerations are required to carry out the invention’ (448).

76 Ibid 453; noting that the threshold for a patentable technical method appears to rest on being more than ‘[a] feature of a method which concerns the use of technical means for a purely non-technical purpose and/or for processing purely non-technical information does not necessarily confer a technical character to such a method’ (453).

of the method or the method itself solve any particular technical problem or achieve any technical effect' being required.⁷⁷ The valid and invalid claims are set out in Table 1. In rejecting the method claims the Board considered that a computer program with a product, albeit the computer program itself, might not be characterised as a computer program 'as such' and so could be patentable.⁷⁸ The present method claim was characterised with all the features being 'steps of processing and producing information having purely administrative, actuarial and/or financial character'.⁷⁹ Without some means of '[p]rocessing and producing such information' that was not 'typical steps of business and economic methods' then the computer was merely performing a business method.⁸⁰ Merely using a computer was not enough without further evidence of a technical character:⁸¹

The feature of using technical means for a purely non-technical purpose and/or for processing purely non-technical information does not necessarily confer technical character to any such individual steps of use or to the method as a whole: in fact, any activity in the non-technical branches of human culture involves physical entities and uses, to a greater or lesser extent, technical means.⁸²

The approach to determining whether the subject matter was excluded was to identify the 'real contribution which the subject matter claimed' and disregard the 'form or kind of claim', and where the contribution was of a technical character then the invention was patentable.⁸³ Thus, with the requisite technical contribution:

... a computer system suitably programmed for use in a particular field, even if that is the field of business and economy, has the character of a concrete apparatus in the sense of a physical entity, man-made for a utilitarian purpose and is thus an invention within the meaning of art 52(1) EPC.⁸⁴

77 Ibid 450.

78 Ibid 447-448.

79 Ibid 449.

80 Ibid 449.

81 The Board in this case was careful to note that '[a]rguments or facts which indicate that the individual steps of the method or the method itself solve any particular technical problem or achieve any technical effect, are not derivable from the patent application and have not been submitted to the board' perhaps suggesting that method claims could have had the requisite technical character but the evidence before the Board was not sufficient to reach this conclusion: *ibid* 450.

82 *Ibid*.

83 *Ibid* 455; this also reflects the 'whole contents approach' that merely because the invention is implemented on a computer does not render it unpatentable: see *Computer-related Invention/VIACOM T208/84* [1987] *Official Journal of the European Patent Office* 14.

84 *Controlling Pension Benefits System/PBS PARTNERSHIP*, *ibid* 452.

In other decisions the Technical Board of Appeal has in effect implemented similar reasoning with some important distinctions. Thus, in *Information Modelling/INTERNATIONAL COMPUTERS*⁸⁵ a claim to a method for analysing a physical system (such as a power plant) and providing an information model reflecting the essential properties of the physical system, and the implementation of the data structure in a computer by means of relational database technology, was found to be unpatentable subject matter. The Board reasoned that informational modelling was ‘a formalized process carried out by a system engineer or a similar skilled person in a first stage of software development for systematically gathering data about the physical system to be modelled or simulated and to provide so to say a real world model of the system on paper’.⁸⁶ Thus, the claim was to ‘an intellectual activity having all the traits typical for non-technical branches of knowledge’ rather than having the requisite ‘purposive use of information modelling in the context of a solution to a technical problem’.⁸⁷ The significance of the decision, however, was that the Board appears to have reached this decision *only* because the claim was expressed broadly to any ‘physical system’, rather than just the preferred embodiment of the control and management of technical processes in a power plant.⁸⁸ The ‘physical system’ to which the alleged invention might be applied was described as ‘large, complex systems’ including manufacturing plants and broadly enough to include ‘any real world system, even business and administrative organisations’.⁸⁹ Interestingly, the Board then considered that the claim to ‘features of a computerized database system’ did address the technical requirement, although in this case this claim failed for obviousness, but not for lack of subject matter.⁹⁰

The technical requirement may be satisfied by a computer program that alerts machine operators when their machines require maintenance,⁹¹ increasing the effectiveness of a computer-controlled device,⁹² improving mail processing,⁹³ and enhancing the quality of a computer display.⁹⁴ Importantly, a technical invention will not lose its technical character merely because it is used for a non-technical

85 T49/94 [2002] unpublished; the claim provided, in part: ‘A method for modelling a physical system in a computer that executes an object-oriented information model based on the physical system, comprising the steps of ...’.

86 *Information Modelling/INTERNATIONAL COMPUTERS*, *ibid* [7].

87 *Ibid*.

88 *Ibid* [7]-[8].

89 *Ibid* [8].

90 *Ibid* [9]-[10].

91 See *Computer-related Inventions/KEARNEY* T42/87 [1989] *Official Journal of the European Patent Office* 211.

92 See *Electronic Computer Components/BOSCH* T164/92 [1993] *Official Journal of the European Patent Office* 89.

93 See *System for Processing Mail/PITNEY BOWES* T767/99 [2002] unpublished.

94 See *Computer-related Inventions/VICOM*, above n 82.

purpose.⁹⁵ However, there may still be some limits in the national jurisdictions. For example, the Court of Appeal in England in *Fujitsu Limited's Application*⁹⁶ dismissed a claim to a method and apparatus for designing inorganic materials that involved a computer programmed so that an operator could select structures displayed by a computer and convert data representing the physical layouts into data representing the crystal structure that would have been obtained by combining the original structures with the resulting data being displayed as an image on a computer screen.⁹⁷ Lamenting the difficulty in determining what constituted a technical contribution,⁹⁸ the Court of Appeal considered the claim was merely a computer program,⁹⁹ rejecting arguments that the technical contribution was the 'the processing of real images or structures' and that the 'application provided a new tool for modelling crystal structure combinations which relieved the chemist of the laborious task of building a model'.¹⁰⁰ Significantly, increased efficiency brought about through using the computer that replaced what had previously been done with plastic models was not a sufficient technical contribution. In other words, an alternative solution for an already solved technical problem or for an already known technical effect may not always be enough to satisfy the technicality requirement.¹⁰¹

Thus, the Australian authority confirms that the mere presentation of information, whether that involves some physical apparatus or not, will not be

95 *General Purpose Management System/SOHEI T769/92* [1995] *Official Journal of the European Patent Office* 525, 536; see also *Controlling Pension Benefits System/PBS PARTNERSHIP*, above n 71, 451.

96 [1997] RPC 608 (Aldous LJ); despite citing Lord Justice Nicholls in *Gale's Application* [1991] RPC 305, 322 that 'it is of the utmost importance that the interpretation given ... by the courts in the United Kingdom, and the interpretation given ... by the European Patent office, should be the same. The intention of [United Kingdom] Parliament was that there should be uniformity in this regard. What is more, any substantial divergence would be disastrous. It would be absurd if, on an issue of patentability, a patent application should suffer a different fate according to whether it was made in the United Kingdom ... or was made in Munich ... Likewise in respect of opposition proceedings' (610).

97 *Fujitsu Limited's Application*, *ibid* 612 (Aldous LJ).

98 *Ibid* 616 (Aldous LJ); in particular the attempt to reconcile the decisions in *Gale's Application*, above n 95 (Nicholl LJ), *Merrill Lynch's Application* [1989] RPC 561 (Fox LJ) and *Computer-related Inventions/VICOM*, above n 82.

99 *Fujitsu Limited's Application*, *ibid* 618-619 (Aldous LJ, with whom Roch and Leggatt LJJ agreed).

100 *Ibid* 618 (Aldous LJ).

101 Although, in direct contrast, the Federal Patent Court in Germany has upheld a claim to a computer implemented method that enabled the industrial production of cable harnesses without the usual construction of prototypes: see *Information from the Contracting States* [2003] *Official Journal of the European Patent Office* 217.

patentable.¹⁰² But the process or product of manipulation and presentation of the same information will be patentable where there is some useful artificially created state of affairs in a field of economic endeavour.¹⁰³ Thus:

Even where such information is of importance in describing or defining an operation to be performed on some apparatus it cannot be regarded as part of the performance itself and thus qualify as a manner of manufacture. If however the marks as such are described to operate through appropriate means automatically to fulfil a commercial purpose, whether the means are mechanical, optical or electrical, they can properly be regarded as an integral part of a manner of manufacture and as such fit subject matter for patent claims.¹⁰⁴

Thus, processing databases using a computer would appear to be potentially patentable in Australia. Arguably, the same approach has been adopted in the United States and the Europe Union. The United States focuses on a 'useful, concrete and tangible result',¹⁰⁵ and the Europe Union focuses on a technical contribution from 'a concrete apparatus in the sense of a physical entity, man-made for a utilitarian purpose'.¹⁰⁶ The effect of these approaches is to make the database (the data structures and software) patentable subject matter if they can be identified with some technical or practical application. This appears to be readily satisfied where there is an apparatus or device, such as a digital computer or software driving the computer, controlling the processing, storage and retrieval of data and presenting the data in a useful and economically valuable form. However, achieving this result will depend on carefully drafted claims that avoid the characterisation of the invention as merely no more than storing the results of a mental or artistic exercise in a database. Further, as the Technical Board of Appeal in *Controlling pension benefits system/PBS PARTNERSHIP*¹⁰⁷ was careful to distinguish in considering the apparatus claims, the subject matter

102 *Fishburn's Application* [1938] 57 RPC 245, 246-247 (Morton J); *Virginia-Carolina Chemical Corp's Application*, above n 38, 36 (Lloyd-Jacob J); see also Australian Patent Office, *Manual of Practice and Procedure*, above n 36, [8.2.8.2] (Vol 2).

103 *Fishburn's Application*, *ibid* 247 (Morton J); see also Australian Patent Office, *Manual of Practice and Procedure*, *ibid* [8.2.8.3] (Vol 2).

104 *Virginia-Carolina Chemical Corp's Application*, above n 38, 36 (Lloyd-Jacob J).

105 *State Street Bank & Trust Co v Signature Financial Group*, above n 60, 1373 (1998) (Rich J).

106 *Controlling Pension Benefits System/PBS PARTNERSHIP*, above n 71, 452; notably, the status of the *Pension Benefit* approach may not be settled as the *Computer-Implemented Inventions Directive* has not been finalized and there appears to be some hesitation in abandoning the 'contribution approach': see Bently and Sherman, above n 12, 406.

107 Above n 71; noting that the Board expressly rejected the 'contribution approach' to assessing subject matter exclusions saying that there 'is no basis in the EPC for applying this so-called contribution approach' (442).

requirements might be satisfied, but it is the other threshold requirements that take on greater importance.¹⁰⁸

The remaining question, however, is whether information *per se* may also be characterised as patentable subject matter? Part 3 considers various court decisions showing how the courts have attempted to distinguish between information *per se* and applications embodying that information. While the outcome remains uncertain, the cases suggest that the courts appear to be heading towards allowing information *per se* to be suitable subject matter for patents in some circumstances.

3. Patenting information *per se*

The Australian High Court's decision in *Research Development Corp v Commissioner of Patents*¹⁰⁹ confirmed the very broad ambit of a patentable inventions as 'wide enough to include electrical energy, despite its non-material character, because of its analogy, in commercial respects, with material commodities',¹¹⁰ and 'it may be any physical phenomenon in which the effect, be it creation or merely alteration, may be observed'.¹¹¹ Thus the High Court confirmed that patentable subject matter included anything 'covering every end produced' with some 'utility in practical affairs',¹¹² although the High Court did contemplate that 'abstract information without any suggestion of a practical application of it to a useful end' was unpatentable.¹¹³ The decision of the Full Federal Court in *CCOM Pty Ltd v Jiejing Pty Ltd*,¹¹⁴ and the decisions of the Federal Court in *International Business Machines Corp v Commissioner of Patents*¹¹⁵ and *Welcome Real-Time SA v Catuity Inc*,¹¹⁶ are consistent with this approach, noting in particular, that Justice Heerey in *Welcome Real-Time SA v Catuity Inc* considered that there was no requirement for a physical observable effect.¹¹⁷ Therefore, it

108 *Controlling Pension Benefits System/PBS PARTNERSHIP*, above n 71, 452; some commentators argue that this is merely a shift of inquiry from subject matter to the other threshold requirements: see for example Bently and Sherman, above n 12, 404-405; this is consistent with its earlier decision, such as *Computer Program Product/IBMT1173/97* [1999] *Official Journal of the European Patent Office* 609.

109 *National Research Development Corp v Commissioner of Patents*, above n 33 (Dixon CJ, Kitto and Windeyer JJ).

110 Ibid 272 (Dixon CJ, Kitto and Windeyer JJ) citing the decision in *Rantzen's Case* (1947) 64 RPC 63 (Evershed J) as '[t]hat this was sound is hardly to be doubted'.

111 Ibid 276 (Dixon CJ, Kitto and Windeyer JJ).

112 Ibid 276 (Dixon CJ, Kitto and Windeyer JJ).

113 Ibid 264 (Dixon CJ, Kitto and Windeyer JJ).

114 *CCOM Pty Ltd v Jiejing Pty Ltd*, above n 35, 514 (Spender, Gummow, Heerey JJ).

115 Above n 53 (Burchett J).

116 Above n 35 (Heerey J).

117 *Welcome Real-Time SA v Catuity Inc*, ibid 354 (Heerey J); although on the facts in that case the writing of new information to the behaviour file and the printing of the coupon was such a physically observable effect (354).

seems entirely consistent with this approach to consider information *per se* patentable subject matter if it can be characterised as a product with a useful practical application¹¹⁸ being ‘a mode or manner of achieving an end result which is an artificially created state of affairs of utility in the field of economic endeavour’.¹¹⁹

The English Patent Appeal Tribunal decision in *Pittman’s Application*¹²⁰ provides an example of the type of reasoning that is consistent with the Australian authorities and where information *per se* was found patentable. In *Pittman’s Application* the Tribunal distinguished between a method of teaching language pronunciation from a mere arrangement of printed words. The invention was a method of conveying to a person reading text the appropriate pronunciation of words that might ordinarily only be apparent from hearing the spoken words. Thus, printed words and syllables were stressed in upper case and inflection up and down were indicated by super and sub-scripts:

THERE are FOUR ASPECTS of LEARN^{ing} a Foreign LAN^{guage}. FIRST of ALL, eve^{ry}ONE WANTS to ^{be} Able to LI^sten to ^{it} with UN^{der}STAN^ding and THEN ^{be} Able to SPEAK ^{it} and ^{be} UN^{der}STOOD. THEN, of COURSE, THEY WANT to ^{be} Able to READ ^{it} and ALSO to WRITE ^{it}.¹²¹

One of the claims to the invention was:

A printed sheet or film carrying a word or words in alphabetic writing in a selected spoken language, said word or words being so presented that information relating to the stressing of parts of the spoken word is conveyed without the use of supplementary diacritical signs, merely by thickness, boldness or size of the characters and that additional information relating to the inflection of parts of the spoken word is conveyed merely by the position of individual characters or groups of characters, relative to the mean axis of the line of writing.¹²²

The Tribunal characterised this as an invention being:

... a variation of the visual significance of a character or group of characters to indicate degrees of stress, a variation in location relative to the mean axis of a line of writing to indicate pitch modulation ... The physical product which will embody this novel presentation of lettered words will be in the form of a sheet or collection of sheets as in a book which will be utilisable either as a manual for personal reading or for

118 *National Research Development Corp v Commissioner of Patents*, above n 33, 264 (Dixon CJ, Kitto and Windeyer JJ).

119 *CCOM Pty Ltd v Jiejing Pty Ltd*, above n 35, 514 (Spender, Gummow and Heerey JJ).

120 [1969] RPC 646 (Lloyd-Jacob J).

121 *Pittman’s Application*, *ibid* 647 (Lloyd-Jacob J).

122 *Ibid* 647 (Lloyd-Jacob J).

submission to the operation of a reading machine wherein scanning and encoding means permit the transmission of the denoted sounds to decoding and reception devices wherein conversion to and emission of speech will be effected.¹²³

The Tribunal decision was that considering the claimed invention in light of its recommended use in a speaking machine there was a definite mechanical purpose, and further, '[i]n its broader aspect of association with the organs of human speech, a functional purpose is no less apparent'.¹²⁴ As the claimed invention could not be solely categorised as 'an intellectual, literary or artistic connotation of matter', there was 'sufficient material' to find that the invention was a 'manner of manufacture' and so patentable.¹²⁵ In these terms health-related information to treat or prevent illness and disease emanating from a computer database might easily be considered as a product with a useful practical application in medical practice and likely to save future health expenses.

Further, if the health-related information *per se* has been transformed into an artificial digital state that then requires a mechanical operation through a computer to collect, compile, store, retrieve and process and then display that information as a product of a process that might be commercially useful, there seems to be a direct analogy with the conclusions of the Full Federal Court in *CCOM Pty Ltd v Jiejing Pty Ltd*.¹²⁶ Remembering that there a database of information was an arrangement and order of characters that was applied through a computer system to produce a product being word processed Chinese characters. In effect the database of character strokes was a reduction of a purely linguistic and mental task that could then be mechanically applied, with the Federal Court fixing on 'the idea' of the invention being the method of characterising the character strokes that were then applied to an apparatus to word process Chinese characters.¹²⁷ The approach in the United States however suggests that there may be some further fine distinctions to the forms of information *per se* that may be relevant.

The fundamental limit to patentability in the United States is that the *Constitution* only authorizes the Congress '[t]o promote the Progress of Science and useful Arts'.¹²⁸ This has been interpreted as being limited to laws promoting:

Innovation, advancement, and things which add to the sum of useful knowledge are inherent requisites in a patent system which by constitutional command must 'promote the Progress of ... useful Arts'.

123 Ibid 649 (Lloyd-Jacob J).

124 Ibid 650 (Lloyd-Jacob J).

125 Ibid 650 (Lloyd-Jacob J).

126 *CCOM Pty Ltd v Jiejing Pty Ltd*, above n 35, 515 (Spender, Gummow, Heerey JJ).

127 Ibid 507 (Spender, Gummow, Heerey JJ).

128 *United States Constitution* art I § 8 cl 8.

This is the standard expressed in the *Constitution* and it may not be ignored.¹²⁹

Arguably, making patents available for information *per se* in the form of a database that may be manipulated and stored in a technological way (such as through a computer and its memory in a machine readable (digital) form) where it is applied in a way that is inventive, an advancement and an addition to the sum of knowledge would seem to be within the *Constitution's* authority – it is potentially achieving a ‘useful, concrete and tangible result’.¹³⁰ However, the courts have not defined the terms ‘useful’, ‘concrete’ and ‘tangible’ in the context of the practical application of computer-related inventions and appear to make a distinction about the form of the ‘structure’. That is, the ‘structure’ related to the template or layout used within the database to organize the information as opposed to the content of the information itself.

These distinctions about ‘structure’ are primarily reflected in the United States Court of Appeals of the Federal Circuit decisions in *In re Alappat*,¹³¹ *In re Lowry*¹³² and *In re Warmerdam*¹³³ and then the application of these principles in the later cases of *State Street Bank & Trust Co v Signature Financial Group*¹³⁴ and *AT&T Corp v Excel Communications Inc.*¹³⁵ The ‘structures’ assessed in *In re Alappat*, *In re Lowry* and *In re Warmerdam* cannot be reduced to a precise definition, but they rather capture the various arrangements of data in a computer according to meaningful relationships.¹³⁶ The court’s decisions in these cases reflect a distinction about the ‘data structure’ in the form of a database so that if it is characterised through the claims as a machine or apparatus it is patentable, but unpatentable if claimed as a method, as it would then be applying

129 *Graham v John Deere Co* 383 US 1, 5-6 (1966).

130 *State Street Bank & Trust Co v Signature Financial Group*, above n 60, 1373 (Rich J).

131 33 F.3d 1526 (1994) (Rich J); note also the decision in *In re Trovato* 42 F.3d 1376 (1994) that used almost identical words to the claims in *In re Alappat* and reached a different result, although that decision was later vacated by *In re Trovato* 60 F.3d 807 (1995) and ‘remanded for reconsideration in the light of *In re Alappat* and any new guidelines adopted by the Patent and Trade Mark Office for examination of computer-implemented inventions’ (807).

132 32 F.3d 1579 (1994) (Rader J).

133 33 F.3d 1354 (1994) (Plager J).

134 Above n 60 (Rich, Plager and Bryson JJ).

135 Above n 62 (Plager, Clevenger, and Rader JJ).

136 The concept was usefully considered in *In re Lowry*, above n 131, 1580 (Rader J): ‘[a] memory stores data according to a particular order or arrangement. Application programs use stored data to perform specified functions. A data model provides the framework for organizing and representing information used by an application program. Data models define permissible data structures - organizational structures imposed upon the data used by the application program - compatible with particular data processing systems. Data structures are the physical implementation of a data model’s organization of the data. Data structures are often shared by more than one application program’.

merely abstract ideas.¹³⁷ Thus, ‘the Federal Circuit views the logical “ghost” as essentially unpatentable subject matter, but the “machine” that the ghost animates as patentable subject matter’.¹³⁸

The *In re Alappat*¹³⁹ invention concerned a means for creating a smooth waveform display in a digital oscilloscope. The invention sampled the input to the oscilloscope, converting that sample to a digital form, then converting it to a bit map stored as a data array that was then displayed according to the data array (pixels), with some pixels being illuminated more than others to give a smooth waveform display on a screen (or rasterizer).¹⁴⁰ Significantly, the invention used a mathematical formula to determine the intensity of illumination in each pixel (anti-aliased pixel illumination) with the formula changing for different wave forms.¹⁴¹ In effect the invention was an arrangement of circuitry elements for converting input data (vector data) into other data (raster data) using a programmed mathematical operation but claimed as a mathematically defined structure. The invention claimed:

A rasterizer for converting vector list data representing sample magnitudes of an input waveform into anti-aliased pixel illumination intensity data to be displayed on a display means comprising: (a) means for determining the vertical distance between the endpoints of each of the vectors in the data list; (b) means for determining the elevation of a row of pixels that is spanned by the vector; (c) means for normalizing the vertical distance and elevation; and (d) means for outputting illumination intensity data as a predetermined function of the normalized vertical distance and elevation.¹⁴²

The majority of the Board of Patent Appeals and Interferences concluded that each step of the claim recited a mathematical operation, that combined to form a ‘mathematical algorithm for computing pixel information’,¹⁴³ and that ‘when the claim is viewed without the steps of this mathematical algorithm, no other elements or steps are found’.¹⁴⁴ Rejecting this characterisation of the invention, the majority of the United States Court of Appeals of the Federal Circuit characterised the invention as a machine (the rasterizer) programmed with arithmetic logic circuits (ALUs) configured to perform an absolute value function, barrel shifters and read only memory (ROM), or their equivalents (including a

137 See Andrew Hollander, ‘Patenting Computer Data Structures: The Ghost, the Machine and the Federal Circuit’ (2003) *Duke Law & Technology Review* 0033.

138 *Ibid* [5].

139 *Above n* 130 (Rich J).

140 *Ibid* 1537 (Rich J).

141 *Ibid* 1538 (Rich J).

142 *Ibid* 1538-1539 (Rich J).

143 *Ex Parte Alappat* 23 USPQ2d 1340, 1345 (Board of Patent Appeals and Interferences 1992).

144 *Ibid* 1346 (Board of Patent Appeals and Interferences 1992).

general purpose digital computer), thus claiming ‘a machine, or apparatus, made up of a combination of known electronic circuitry elements’.¹⁴⁵

The significance of the *In re Alappat* decision was to clarify that ‘mathematical algorithms’ were not excluded subject matter when ‘reduced to some type of practical application’¹⁴⁶ and that ‘a general purpose computer in effect becomes a special purpose computer once it is programmed to perform particular functions pursuant to instructions from program software’.¹⁴⁷ Significantly, this conclusion reflected the line of authority from the Supreme Court, including most recently *Diamond v Diehr*,¹⁴⁸ that at the heart of the analysis of mathematical algorithms was:

... whether the claim as a whole is directed to statutory subject matter, it is irrelevant that a claim may contain, as part of the whole, subject matter which would not be patentable by itself ... the proper inquiry in dealing with the so called mathematical subject matter exception to [35 USC] § 101 alleged herein is to see whether the claimed subject matter *as a whole* is a disembodied mathematical concept, whether categorized as a mathematical formula, mathematical equation, mathematical algorithm, or the like, which in essence represents nothing more than a ‘law of nature’, ‘natural phenomenon’, or ‘abstract idea’.¹⁴⁹

The majority was therefore able to characterise the claim ‘as a whole’ as ‘circuitry elements that perform mathematical calculations’ directed to a combination of interrelated elements that combined to form ‘a machine for converting discrete waveform data samples into anti-aliased pixel illumination intensity data’ that

145 *In re Alappat*, above n 130, 1541 (Rich J).

146 *Ibid* 1543 (Rich J); the footnote significantly provides: ‘The Supreme Court’s use [in *Diamond v Diehr* 450 US 175 (1981), *Parker v Flook* 437 US 584 (1978) and *Gottschalk v Benson* 409 US 63 (1972)] of such varying language as “algorithm”, “formula”, and “equation” merely illustrates the understandable struggle that the Court was having in articulating a rule for mathematical subject matter, given the esoteric nature of such subject matter and the various definitions that are attributed to such terms as “algorithm”, “formula”, and “equation”, and not an attempt to create a broad fourth category of excluded subject matter’ (1543).

147 *In re Alappat*, above n 130, 1545 (Rich J).

148 Above n 145; other relevant decisions being *Parker v Flook*, above n 145, and *Gottschalk v Benson*, above n 145.

149 *In re Alappat*, above n 130, 1543-1544 (Rich J); Justice Rich cited *Diamond v Diehr*, above n 145, 187, and noted that the *Freeman-Walter* two-part test ‘is not an improper analysis’, whereby ‘if a mathematical algorithm is found, the claim *as a whole* is further analyzed to determine whether the algorithm is “applied in any manner to physical elements or process steps”, and, if it is, it “passes muster under [35 USC] § 101”’: see *In re Pardo* 684 F.2d 912, 915 (1982) (Miller J).

was then displayed on a ‘display means’.¹⁵⁰ The invention was thus ‘a specific machine to produce a useful, concrete, and tangible result’.¹⁵¹

Then, *In re Lowry*¹⁵² concerned a patent for the storage, use, and management of information in a computer memory where the database information was represented by its characteristics and relationships to other information within the database (being orders and arrangements of data). Importantly, the invention claimed:

A memory for storing data for access by an application program being executed on a data processing system, comprising: a data structure stored in said memory, said data structure including information resident in a database used by said application program ...¹⁵³

The court distinguished computer processing information from processing by the human mind, thus excluding the printed matter cases,¹⁵⁴ but then considered claims to the information *per se* and claims to the physical ordering and arrangement of data, finding that the invention here claimed the physical organisation of the information with an efficiency in computer operation.¹⁵⁵ Thus, the claim was to the physical structures imposed on the information rather than the information *per se* in the database.¹⁵⁶ However, the physical ordering and arrangement of data in a computer memory comprises sequences of digital data stored in the memory as electrical (or magnetic) signals that represented in effect information *per se*. In confounding its requirement for the ‘physical’ the court set out contradictory statements,¹⁵⁷ concluding that Lowry had done more than claim the information *per se*:

Lowry does not claim merely the information content of a memory. Lowry’s data structures, while including data resident in a database, depend only functionally on information content. While the information content affects the exact sequence of bits stored in accordance with Lowry’s data structures, the claims require specific electronic structural elements which impart a physical organization on the

150 *In re Alappat*, *ibid* 1544 (Rich J).

151 *Ibid* 1544 (Rich J).

152 *Above* n 131 (Rader J).

153 *Ibid* 1581 (Rader J).

154 The cases ‘deall[ing] with claims defining as the invention certain novel arrangements of printed lines or characters, useful and intelligible only to the human mind’: *In re Bernhart* 417 F.2d 1395, 1399 (1969).

155 *In re Lowry*, *above* n 131, 1583 (Rader J).

156 Although it is notable that the Federal Circuit says both that ‘[i]n Lowry’s invention, the stored data adopt no physical “structure” *per se*’ and that ‘Lowry’s data structures impose a physical organization on the data’: *ibid* 1583 (Rader J).

157 Thus in consecutive paragraphs the court says ‘[r]ather, Lowry’s data structures impose a physical organization on the data’ and ‘[i]n Lowry’s invention, the stored data adopt no physical “structure” *per se*’: *ibid* 1583 (Rader J).

information stored in memory. Lowry's invention manages information. As Lowry notes, the data structures provide increased computing efficiency.¹⁵⁸

Following the *In re Lowry* decision information *per se* reduced to a digital form and stored in memory appears to be a 'structure' for the purposes of patentable subject matter where they are capable of causing a functional change in a computer and there is some identifiable advantage.

In contrast, the invention in *In re Warmerdam*¹⁵⁹ was directed to methods (claims 1 to 4) and an apparatus (claim 5) for controlling robots to avoid collision with other moving or fixed objects. The method claims disclosed an invention whereby a database of information about the locations of objects to be avoided was maintained in the computer memory and simplified by calculating, using a mathematical algorithm, a hierarchy of circles around the objects to be avoided by the moving robot.¹⁶⁰ The primary method claim 1, the other method claims 2 to 4 being dependent claims, was to devise:

A method for generating a data structure which represents the shape of physical object in a position and/or motion control machine as a hierarchy of bubbles, comprising the steps of: first locating the medial axis of the object and then creating a hierarchy of bubbles on the medial axis ...¹⁶¹

The court found the method claims (claims 1 to 4) were invalid as they were merely the manipulation of the ideas expressed in a mathematical form.¹⁶² Here the preferred embodiment was a series of steps utilizing 'the Hilditch Skeletonization method to locate the medial axis, followed by utilization of a top-down or bottom-up procedure for creating the bubble hierarchy', and so it was solving a mathematical algorithm.¹⁶³ However, the apparatus claim to '[a] machine having a memory which contains data representing a bubble hierarchy generated by the method of any of Claims 1 through 4'¹⁶⁴ was valid as it was 'for a machine, and is clearly patentable subject matter',¹⁶⁵ the 'machine' being a

158 Ibid.

159 Above n 132 (Plager J).

160 Ibid 1355-1358 (Plager J).

161 Ibid 1357 (Plager J).

162 Ibid 1360 (Plager J).

163 Ibid 1360 (Plager J).

164 Ibid 1358 (Plager J).

165 Ibid 1360 (Plager J); the contention before the court was that the claim was indefinite for the purposes of 35 USC §112 on the basis that 'the claim does not conform to the conventional format of a product-by-process claim because it is unclear how a memory is produced by the steps recited in claims 1-4' and 'the bubble hierarchy which is created in the recited steps is not "an exact, well-defined data structure"' (1360-1361).

‘general purpose computer’.¹⁶⁶ The confusion from this decision was that the court expressly recognized that claim 1 was broad enough to cover methods for locating the medial axis of an object by ‘physically measuring the contour of the object with a ruler’ or ‘eyeballing the object, and then creating the bubble hierarchy by manually drawing it’, that were more than merely solving a mathematical algorithm.¹⁶⁷ Despite this, the decision was that ‘the claim involves no more than the manipulation of abstract ideas’, and so was unpatentable.¹⁶⁸

The decisions in *In re Lowry* and *In re Warmerdam* may be reconciled by accepting the court’s confusion over the term ‘data structure’,¹⁶⁹ recognising that it is the form of the claim that overcomes the subject matter threshold. To be a valid claim to a database invention the claim must be in the form of a machine operation. Thus, the method claims in *In re Warmerdam* may have failed because they were about the manipulation of an abstract idea or algorithm, while a similar manipulation in *In re Lowry* could be described as producing ‘a useful, concrete and tangible result’.¹⁷⁰

Applying these principles in *State Street Bank & Trust Co v Signature Financial Group*,¹⁷¹ United States Court of Appeals of the Federal Circuit concluded that:

Unpatentable mathematical algorithms are identifiable by showing they are merely abstract ideas constituting disembodied concepts or truths that are not ‘useful’.¹⁷² To be patentable ‘an algorithm must be applied in a ‘useful’ way.’¹⁷³

The invention here was a system that allowed an administrator to monitor and record the financial information flows and make all the calculations necessary for maintaining partner fund financial services including tracking all the daily data

166 *In re Warmerdam*, above n 132, 1355 (Plager J).

167 Ibid 1359 (Plager J).

168 Ibid 1360 (Plager J); noting that the court concluded that a physical measurement step was indistinguishable from the data gathering step which had been held in the Federal Circuit in *In re Grams* 888 F.2d 835 (1989) (Archer J) to be unpatentable (1360).

169 See the commentary in Hollander, above n 36.

170 Granted patents to such claims include United States Patent 6,385,350, *Method and Apparatus for Producing a Hybrid Data Structure for Displaying a Raster Image* (2002); United States Patent 6,279,143, *Method and Apparatus for Generating a Database Which is Used for Determining the Design and Quality of Network Nodes* (2002); see generally Steven Hultquist, Robert Harrison and Yongzhi Yang, ‘Patenting Bioinformatics Inventions: Emerging Trends in the United States’ (2002) 20 *Nature Biotechnology* 743.

171 Above n 60 (Rich, Plager and Bryson JJ).

172 *State Street Bank & Trust Co v Signature Financial Group*, above n 60, 1373 (Rich J).

173 Ibid 1373 (Rich J).

to calculate aggregate year end income, expenses, and capital gain or loss for accounting and for tax purposes.¹⁷⁴ The claim was:

A data processing system for managing a financial services configuration of a portfolio established as a partnership, each partner being one of a plurality of funds, comprising: (a) computer processor means for processing data; (b) storage means for storing data on a storage medium; (c) first means [an arithmetic logic circuit configured to prepare the data disk to magnetically store selected data] for initializing the storage medium; (d) second means [an arithmetic logic circuit configured to retrieve information from a specific file, calculate incremental increases or decreases based on specific input, allocate the results on a percentage basis, and store the output in a separate file] for processing data regarding assets in the portfolio and each of the funds from a previous day and data regarding increases or decreases in each of the funds, assets and for allocating the percentage share that each fund holds in the portfolio ...¹⁷⁵

The United States Court of Appeals of the Federal Circuit characterised this as a claim to a machine, being ‘a data processing system’ with ‘means-plus-function elements’ recited in the claim.¹⁷⁶ Thus, the claimed data processing system for implementing a financial management structure constituted a practical application of a mathematical algorithm because it produced a ‘useful, concrete and tangible result’.¹⁷⁷ The:

... transformation of data, representing discrete dollar amounts, by a machine through a series of mathematical calculations into a final share price, constitutes a practical application of a mathematical algorithm, formula, or calculation, because it produces ‘a useful, concrete and tangible result’ – a final share price momentarily fixed for recording and reporting purposes ...¹⁷⁸

The United States Court of Appeals of the Federal Circuit pointed to the decision in *In re Alappat* (and before that the Supreme Court decision in *Diamond v Diehr*) as establishing that ‘the mere fact that a claimed invention involves inputting numbers, calculating numbers, outputting numbers, and storing numbers, in and of itself, would not render it non-statutory subject matter, unless, of course, its operation does not produce a “useful, concrete and tangible result”’.¹⁷⁹ Thus the critical question is ‘whether a claim encompasses statutory subject matter should ... focus ... on the essential characteristics of the subject matter, in particular, its

174 Ibid 1371 (Rich J).

175 Ibid 1371-1372 (Rich J).

176 Ibid 1372 (Rich J).

177 Ibid 1373 (Rich J).

178 Ibid 1373 (Rich J).

179 Ibid 1374 (Rich J).

practical utility’ – that is, that it produces a ‘useful, concrete, and tangible result’.¹⁸⁰

Then in *AT&T Corp v Excel Communications Inc*,¹⁸¹ the United States Court of Appeals of the Federal Circuit considered a computer based switch that monitored and recorded ‘fields of information such as the originating and terminating telephone numbers, and the length of time of the call’ that could then be transmitted from the switch and reformatted to a message data system for processing and billing.¹⁸² The claim 1 provided:

A method for use in a telecommunications system in which interexchange calls initiated by each subscriber are automatically routed over the facilities of a particular one of a plurality of interexchange carriers associated with that subscriber, said method comprising the steps of: generating a message record for an interexchange call between an originating subscriber and a terminating subscriber, and including, in said message record, a primary interexchange carrier (PIC) indicator having a value which is a function of whether or not the interexchange carrier associated with said terminating subscriber is a predetermined one of said interexchange carriers.¹⁸³

The United States District Court for the District of Delaware had rejected this claim on the basis that it was in substance a mathematical algorithm as the invention took information already known to the telecommunication system and retrieved it for a new reformatted use in billing in effect gathering and reformatting data through an algorithm.¹⁸⁴ The United States Court of Appeals of the Federal Circuit disposed of the *In re Warmerdam* decision saying that ‘[w]hether one agrees with the court’s conclusion on the facts’ the decision stood only for the proposition that mere laws of nature, natural phenomena, and abstract ideas are not patentable subject matter.¹⁸⁵ The proper approach was to determine ‘whether there is a mathematical algorithm at work, but on whether the algorithm-containing invention, as a whole, produces a tangible, useful, result’,¹⁸⁶ following the approach in *State Street Bank & Trust Co v Signature Financial Group* and before that in *In re Alappat*.¹⁸⁷ Applying this principle:

It is clear from the written description of the ... patent that AT&T is only claiming a process that uses the Boolean principle in order to

180 Ibid 1375 (Rich J).

181 Above n 62 (Plager, Clevenger and Rader JJ).

182 *AT&T Corp v Excel Communications Inc*, ibid 1354 (Plager J).

183 Ibid 1354 (Plager J).

184 *AT&T Corp v Excel Communications Inc* 1998 WL 175878, 6-7 (District of Delaware 1998) (Robinson J).

185 *AT&T Corp v Excel Communications Inc*, above n 62, 1360 (Plager J).

186 Ibid 1361 (Plager J).

187 Ibid 1359-1360 (Plager J).

determine the value of the PIC [primary interexchange carrier] indicator. The PIC indicator represents information about the call recipient's PIC, a useful, non-abstract result that facilitates differential billing of long-distance calls made by an [long-distance service (interexchange) carriers]'s subscriber. Because the claimed process applies the Boolean principle to produce a useful, concrete, tangible result without pre-empting other uses of the mathematical principle, on its face the claimed process comfortably falls within the [proper subject matter].¹⁸⁸

While these decisions do not finally establish that information *per se* is patentable, they do show the court's approach to dealing with mathematical algorithms and other abstract matters. Significantly, the courts appear to consider whether the claims as a whole are directed to suitable subject matter,¹⁸⁹ accept that computers as machines are capable of producing 'a useful, concrete and tangible result',¹⁹⁰ and that the electrical or magnetic signals stored in the computer memory may form a sufficient 'physical' structure.¹⁹¹ Perhaps suggesting a future path the decision in *In re Lowry* did accepted a claim to a 'data structure' with 'said data structure *including* information resident in a database used by said application program' (emphasis added).¹⁹²

In Europe, the European Patent Office expressly distinguishes between ordinary (cognitive) information and special (functional) information, the latter being suitable subject matter for patents.¹⁹³ Thus in *Colour Television Signal/BBC*¹⁹⁴ the Technical Board of Appeal considered whether a television signal should be considered as an unpatentable presentation of information and stated:

... a TV system solely characterised by the information *per se*, eg moving pictures, modulated upon a standard TV signal, may fall under the exclusion of art 52(2)(d) and (3) EPC but not a TV signal defined in

188 Ibid 1358 (Plager J).

189 See *State Street Bank & Trust Co v Signature Financial Group*, above n 60, 1375 (Rich J); see also *In re Alappat*, above n 130, 1543-1544 (Rich J).

190 See *State Street Bank & Trust Co v Signature Financial Group*, *ibid* 1374 (Rich J); see also *In re Alappat*, *ibid* 1544 (Rich J); see also *In re Lowry*, above n 131, 1583 (Rader J) citing *In re Bernhart* 417 F.2d 1395, 1400 (1969) for the proposition 'that if a machine is programmed in a certain new and unobvious way, it is physically different from the machine without that program; its memory elements are differently arranged. The fact that these physical changes are invisible to the eye should not tempt us to conclude that the machine has not been changed'.

191 *In re Lowry*, *ibid* 1583 (Rader J).

192 *Ibid* 1581 (Rader J).

193 *European Patent Convention* art 52(2)(d) provides that 'presentations of information' are not patentable; see generally Bently and Sherman, above n 12, 414-416.

194 T163/85 [1990] *Official Journal of the European Patent Office* 379.

terms which inherently comprise the technical features of the TV system in which it occurs ...¹⁹⁵

Applying this reasoning in *Data Structure Products/PHILIPS*¹⁹⁶ to a claim for a record carrier having data recorded on it, the Technical Board of Appeal concluded that the information *per se* was 'functional data' that inherently comprised the technical features of a reader and record carrier in a novel format and was therefore patentable.¹⁹⁷ The distinction between patentable 'functional data' and unpatentable 'cognitive information' in relation to the requisite 'technical effect' was illustrated by the human meaning attributed to the information *per se*.¹⁹⁸ Thus, loss of the 'cognitive information' picture on the television screen would result in meaningless 'snow' with no technical effect on the workings of the television, while loss of the 'functional data' impaired the television's operation.¹⁹⁹ This might also be described as a distinction between information as data and information as data with meaning.²⁰⁰ Thus the claimed invention of a record carrier with recorded data comprised the functional data as a data structure of picture line synchronisations, line numbers and addresses and this information *per se* was patentable, subject to the other threshold requirements being satisfied.²⁰¹

The significance of the *Data Structure Products/PHILIPS* decision was to clarify that if the process or apparatus for presenting the information *per se* discloses a technical feature then the invention may be patentable. Put another way, if the invention can be characterised in a way that the information *per se* forms part of the technical features of the record carrier then the information *per se* will be patentable.²⁰² However, this distinction might be difficult to apply where the information *per se* can be both 'cognitive' and 'functional'. For example, in

195 *Colour Television Signal/BBC*, above n 193, 384; see also *Data Structure Products/PHILIPS* T1194/97 [2000] *Official Journal of the European Patent Office* 525, 538.

196 *Ibid.*

197 *Ibid.*, 538-539.

198 *Ibid.*, 539.

199 *Ibid.* 539.

200 The Technical Board of Appeal citing a dictionary definition: '... information must not be confused with meaning. In fact, two messages, one which is heavily loaded with meaning and the other of which is pure nonsense, can be exactly equivalent, from the present (information technology) viewpoint, as regards information. Information in communication theory relates not so much to what you do say, as to what you could say. That is, information is a measure of none's freedom of choice when one selects a message': *ibid.* 540.

201 *Ibid.* 539-540; notably the invention was novel as the features of the functional data were novel and their anticipation was 'so vanishingly small that in practice the present claim would not restrict legitimate unrelated third party activities' (542-543).

202 *Ibid.* 538-539.

*Townsend's case*²⁰³ the High Court in England considered a patent claiming an advent calendar with each door marked in a way that multiple users could benefit from the treats behind door:

An advent calendar for counting the days from a first date to a second date comprising a plurality of mutually spaced doors, each door being identified as associated with a particular day and adapted to reveal, upon opening, a respective treat characterised in that at least one door is further identified by an *additional indicium* (emphasis added).²⁰⁴

The applicant argued in *Townsend's case* that the markings on each door signifying the desired user were an 'expression' of information carried in the markings, as opposed to a 'provision' of information.²⁰⁵ The difference being that '[t]o mark an advent calendar door with the words "only three more shopping days to Christmas" is the provision of information' while that 'those words to be printed in Times Roman font is to stipulate the expression of the information carried by the words'.²⁰⁶ This argument was rejected saying the markings, however characterised, were merely 'providing information'.²⁰⁷ However, if the advent calendar had itself been an invention then the markings could be characterised as an integral working of the invention.

The consequence of these decision arguably means that by using a computer to store and analyse data, the information *per se* in the data structure as a whole may be characterised as a useful non-abstract result that satisfies the requirement of being 'a useful, concrete, tangible result' or a 'technical' feature, and may then fall within the ambit of the claims. However, as the United States Court of Appeals of the Federal Circuit was careful to note in *State Street Bank & Trust Co v Signature Financial Group* 'statutory subject matter must also satisfy the other "conditions and requirements" of Title 35 [patentability], including novelty, non-obviousness, and adequacy of disclosure and notice',²⁰⁸ echoing the European decisions such as *Controlling pension benefits system/PBS PARTNERSHIP*,²⁰⁹ and perhaps signalling that information *per se* is patentable subject matter, but with the focus moving to the other threshold requirements of patentability.

4. Conclusions

The analysis in this article suggests that computer-based database data structures and the software are certainly patentable, although there remains some doubt

203 [2004] EWHC 482 (Laddie J)

204 *Townsend's case*, *ibid* [5] (Laddie J).

205 *Ibid* [8]-[9] (Laddie J).

206 *Ibid* [9] (Laddie J).

207 *Ibid* [10] (Laddie J).

208 *State Street Bank & Trust Co v Signature Financial Group*, above n 60, 1375 (Rich J).

209 Above n 71, 452.

whether information *per se* is also suitable patentable subject matter. The very wide scope of the High Court's 'principle' in the *National Research Development Corp v Commissioner of Patents*²¹⁰ as it has been interpreted by the Full Federal Court in *CCOM Pty Ltd v Jiejing Pty Ltd*²¹¹ suggests that information *per se* may itself be patentable subject matter depending on the way the invention is characterised and then claimed. The decisions from both the United States and Europe provide further guidance as to how information *per se* might be characterised as patentable and how an Australian court might reason that information *per se* can be patentable subject matter.

The characterisation in the United States decision in *In re Lowry*²¹² illustrates that information *per se* reduced to a digital form, stored in memory and capable of causing a functional change in a computer where there is some identifiable advantage may render the information *per se* patentable. However, the reasoning in this decision was confused,²¹³ and the other decisions do not directly address this issue. This is perhaps not surprising as the argument in these decisions, including *In re Lowry*, were directed to patenting mathematical algorithms and not the information *per se*. Applying these decisions in practice, the United States Patent and Trade Mark Office (USPTO) distinguishes between patentable 'functional descriptive material' and unpatentable 'non-functional descriptive material'.²¹⁴ The latter include 'music, literary works and a compilation or mere arrangement of data'.²¹⁵ This distinction expressly focuses on the function of the information *per se*:

Where certain types of descriptive material, such as music, literature, art, photographs and mere arrangements or compilations of facts or data, are merely stored so as to be read or outputted by a computer without creating any functional interrelationship, either as part of the stored data or as part of the computing processes performed by the computer, then such descriptive material alone does not impart functionality either to the data as so structured, or to the computer.²¹⁶

Applying this distinction, the USPTO characterises *In re Lowry* as a patentable claim to a data structure stored on a computer-readable medium that increases computer efficiency while *In re Warmerdam* as an unpatentable claim to a data structure *per se* with no articulated function.²¹⁷

210 *National Research Development Corp v Commissioner of Patents*, above n 33, 275 (Dixon CJ, Kitto and Windeyer JJ).

211 *CCOM Pty Ltd v Jiejing Pty Ltd*, above n 35, 511 (Spender, Gummow and Heerey JJ).

212 Above n 131 (Rader J).

213 See *In re Lowry*, above n 131, 1583 (Rader J).

214 United States Patent and Trade Mark Office, *Manual of Patent Examining Procedure* (8th ed, 2004) 2100-11.

215 *Ibid* 2100-11-2100-12.

216 *Ibid* 2100-13.

217 *Ibid* 2100-12.

In Europe, the patentability of information *per se* seems more clearly dependant on the way it is characterised and the medium in which it is processed and used. The effect of the reasoning in *Data Structure Products/PHILIPS* was to find that a data structure defined in terms of coded picture line synchronisations, line numbers, and addresses together with a reading device and record on which a coded picture was recorded in a novel format was patentable.²¹⁸ The Technical Board of Appeal distinguished between ‘functional information’ and ‘cognitive information’ essentially finding that where the representation of information was not directly useable by humans and required a technical processing means (a reading machine), it could not be said to be a ‘presentation of information’ and was therefore patentable.²¹⁹ The appellant tried to distinguish information in a book from information in ‘a gramophone record characterised by the musical work and a magnetic tape carrying a computer program’.²²⁰ The appellant argued the book might be excluded from patenting because ‘it brought its content to a human’, while the gramophone record should not be excluded as it ‘constituted a carrier comprising physical phenomenon to be interpreted by a reading device as symbols’.²²¹ While the Board’s decision did not expressly endorse this distinction, the Board did distinguish between ‘cognitive information’ as unpatentable information *per se* because it was ‘cognitive or aesthetic content directly to a human’.²²² In contrast patentable ‘functional information’ would ‘encompass[] physical interactions within and between machines which do not convey any humanly understandable meaning’.²²³

While neither the United States nor European approach accepts information *per se* as definitely patentable, both approaches show that it is certainly open to a court to accept information *per se* as patentable in some circumstances. Some indication of the possible limits on such claims was considered in the USPTO, European Patent Office (EPO) and Japan Patent Office Trilateral Project on protein 3-dimensional structure related claims.²²⁴ There the patent offices concluded that stand alone claims to a computer model,²²⁵ a data array comprising

218 *Data Structure Products/PHILIPS*, above n 194, 529-530.

219 *Ibid* 538-539.

220 *Ibid* 529.

221 *Ibid* 529: albeit that a gramophone might be excluded as the novel musical work did not involve a technical consideration or the novel musical work was ‘an aesthetic creation’ (529); see also *General Purpose Management System/SOHEI*, above n 94.

222 *Data Structure Products/PHILIPS*, *ibid* 542.

223 *Ibid* 541.

224 United States Patent and Trademark Office, European Patent Office and Japan Patent Office, *Report on Comparative Study on Protein 3-Dimensional (3-D) Structure Related Claims*, Trilateral Project WM4 (2002).

225 ‘A computer model of protein P generated with the atomic coordinates listed in Fig. 1’: *ibid* 7.

atomic coordinates of protein,²²⁶ a data array and computer-readable storage medium encoded with the atomic coordinates,²²⁷ a database encoded with data comprising names and structure,²²⁸ and the pharmacophore,²²⁹ were mere presentations of information or abstract ideas which had not been practically applied and were therefore unpatentable.²³⁰ However, where the claim was to an 'isolated' protein with an activity with its structure defined by coordinates²³¹ or a pharmacophore,²³² or a polypeptide comprising a binding pocket of protein defined by structural coordinates,²³³ the claims could be appropriate subject matter, but could failed for want of novelty and inventive step.²³⁴ Where the computer-based data array of information (or idea) had been practically applied, as in *In re Lowry*, was not specifically addressed. However, the reasoning provided by the patent offices indicates this might be a matter of characterisation. The EPO suggested that data encoded on a computer-readable storage medium with a computer program having the requisite technical character could be patentable.²³⁵ The USPTO suggested that if the protein data stored on the computer-readable medium had provided functionality to the data or computer, either as part of the stored data or as part of the computing processes performed by the computer, it might have been patentable.²³⁶ The JPO provided that:

226 'A data array comprising the atomic coordinates of protein P as set forth in Fig. 1 which, when acted upon by a protein modeling algorithm, yields a representation of the 3-D structure of protein P': *ibid* 7.

227 'A computer-readable storage medium encoded with the atomic coordinates of protein P as shown in Fig. 1': *ibid* 7.

228 'A database encoded with data comprising names and structures of compounds identified by the method of claim 1': *ibid* 11.

229 'A pharmacophore having a spatial arrangement of atoms within a molecule defined by the following formula ... in which A and B both represent an electron donor atom, C represents a carbon atom that is part of a hydrophobic group, and the distances represent the distances between the centers of the respective atoms': *ibid* 12; a pharmacophore is 'a description of a generalized concept of molecular features in terms of information on spatial arrangement of chemical elements (eg hydrophobic groups, charged/ionizable groups, hydrogen bond donors/acceptors, and substructures) that are considered to be responsible for a desired biological activity' (13).

230 *Ibid* 14-15; see also Itsuki Shimbo, Rie Nakajima, Shigeyuki Yokoyama and Kiochi Sumikura, 'Patent Protection for Protein Structure Analysis' (2004) 22 *Nature Biotechnology* 109.

231 'An isolated and purified protein having the structure defined by the structural coordinates as shown in Fig. 1': *ibid* 7.

232 'An isolated compound or its salt defined by the pharmacophore in claim 1': *ibid* 12.

233 'An isolated and purified molecule comprising a binding pocket of protein P defined by the structural coordinates of amino acid residues 223, 224, 227, 295, 343, 366, 370, 378 and 384 according to Figure 1': *ibid* 9.

234 See *ibid* 30-31.

235 *Ibid* 15.

236 *Ibid* 16.

There may be cases where data is a statutory invention if it is featured by data structure (logical structure of data defined by interrelationship among data elements) and information processing by the data structure is concretely realized by using hardware resources.²³⁷

Thus, where the information *per se* is stored in a computer as a part of a mechanical invention where it produces a useful effect, albeit just an increased efficiency in information management, then the invention may be patentable. These developments should perhaps be expected, given the increasing powers of computers to collect, compile, store, retrieve and process data more efficiently than conventional management practices and experimental research and development. In many cases computers now perform tasks that were not possible with conventional management tools and experimentation and can be expected to perform tasks that are otherwise not possible. The operation of these computers therefore moves away from merely being machines that undertake abstract mathematical manipulations or mere presentations of information to machines delivering a product with economic utility and value.²³⁸ In these circumstances the assessment that information *per se* has no practical application (being a discovery at best),²³⁹ or belongs only to the 'useful arts'²⁴⁰ appears to be incorrect as the information *per se* becomes an integral part of the technical and mechanical endeavour.

This analysis is significant as formal regulation is emerging to deal with the increasing amount and content of health-related entries in databases about individuals, and inferentially about their relatives, although the role of patents under the *Patents Act 1990* (Cth) has not been considered relevant to date.²⁴¹ With the increasing sophistication of health-related databases and the ability to use computers to collect, compile, store, retrieve and process data and information more efficiently and effectively, and in many cases perform tasks not otherwise possible, the potential for information *per se* to be characterised as patentable subject matter seems certain. The conclusion in this article must be that there is considerable potential for patents to apply to both databases and the information

237 Ibid 15.

238 For an informative overview of the conception of computer software as an electromechanical machines with logical structures: Robert Plotkin, 'Computer Programming and the Automation of Invention: A Case for Software Patent Reform' (2003) *UCLA Journal of Law & Technology* 7.

239 See for example *National Research Development Corp v Commissioner of Patents*, above n 33, 264 (Dixon CJ, Kitto and Windeyer JJ).

240 See for example *Virginia-Carolina Chemical Corporation's Application*, above n 38, 36 (Lloyd-Jacob J).

241 For example, the Australian Law Reform Commission did not consider database patenting in its assessment of regulating health-related genetic information or health-related gene patenting: see Australian Law Reform Commission, above n 9; Australian Law Reform Commission, above n 10.

per se in those databases, and that any regulation of health-related databases needs to consider the consequences of the *Patents Act 1990* (Cth).

Table 1:

The European Patent Office's Technical Board of Appeal in *Controlling pension benefits system/PBS PARTNERSHIP* T931/95 [2001] *Official Journal of the European Patent Office* 441 found that apparatus claims for a computer-controlled pension benefits system that stored and processed information were patentable (claim 5), while method claims for merely controlling the system were unpatentable business methods (claim 1).

| Invalid (method) | Valid (apparatus) |
|---|---|
| <p>1. A <i>method</i> of controlling a pension benefits program by administering at least one subscriber employer account on behalf of each subscriber employer's enrolled employees each of whom is to receive periodic benefits payments, said method comprising: providing to a data processing means information from each said subscriber employer defining the number, earnings and ages of all enrolled employees of the said subscriber employer; determining the average age of all enrolled employees by average age computing means; determining the periodic cost of life insurance for all enrolled employees of said subscriber employer by life insurance cost computing means; and estimating all administrative, legal, trustee, and government premium yearly expenses for said subscriber employer by administrative cost computing means; the method producing, in use, information defining each subscriber employer's periodic monetary contribution to a master trust, the face amount of a life insurance policy on each enrolled employee's life to be purchased from a life insurer and assigned to the master trust and to be maintained in full force and effect until the death of the said employee, and periodic benefits to be received by each enrolled employee upon death, disability or retirement.</p> | <ul style="list-style-type: none"> • 5. An apparatus for controlling a pension benefits system comprising: a data processing means which is arranged to receive information into a memory from each subscriber employer defining the number, earnings and ages of all enrolled employees, said data processing means including a processor which includes: A. average age computing means for determining the average age of all enrolled employees; B. life insurance cost computing means for determining the periodic cost of said life insurance for all enrolled employees of said subscriber employer; C. administrative cost computing means for estimating all administrative, legal, trustee, and government premium yearly expenses for said subscriber employer; the apparatus being arranged to produce, in use, information defining each subscriber employer's monetary contribution to a master trust; the face amount of each life insurance policy to be issued and made payable to said master trust by a life insurer on the life of each enrolled employee and to be maintained in full force and effect until the death of the said employee; and periodic benefits payable by said master trust to each enrolled employee upon death, disability, or retirement. |