AIC Analysis Paper

NATIONAL SURVEY OF RESEARCH COMMERCIALISATION YEARS 2001 AND 2002

Selected measures of commercialisation activity in universities and publicly funded research agencies.

The results of DEST's second and third National Survey of Research Commercialisation show that Australia's universities, medical research institutes, co-operative research centres, the CSIRO and other publicly funded research agencies make a growing contribution to the commercialisation of publicly funded research in Australia, and through this to economic and jobs growth.

The report builds on the findings of the first National Survey of Research Commercialisation conducted for the year 2000 and published in September 2002. Conducted annually, the survey provides a picture of the commercialisation performance of Australia's publicly funded research organisations as well as a basis for benchmarking our performance against that of our international peers.

The first study was carried out jointly by the Australian Research Council (ARC), the National Health and Medical Research Council (NHMRC) and the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and sought data on the commercialisation of research in 2000 from 34 universities, 15 medical research institutes (MRIs) and all 21 CSIRO research divisions.

In 2003, DEST commissioned the Australian Institute for Commercialisation to perform the second and third National Surveys of Research Commercialisation, seeking data for 2001 and 2002. Coverage was significantly extended for the 2001 and 2002 surveys to include the Australian Institute of Marine Sciences (AIMS), the Australian Nuclear Science and Technology Organisation (ANSTO) and the Defence Science and Technology Organisation (DSTO). Additionally, the surveys collected data directly for the first time from cooperative research centres (CRCs).

In total, 113 organisations responded to the 2001 survey (70% response rate) and 124 organisations for the 2002 survey (77% response rate), compared with 50 for

the first survey. As well as extending the coverage to institutions not covered in the first survey, there was a significant increase in the number of MRI respondents, up from 15 responses in 2000 to 33 and 35 for 2001 and 2002 respectively.

With three years of data now available, results from the 2000 survey are included alongside the 2001 and 2002 data for comparative purposes. These results relate to those 45 institutions which responded to the surveys in all three years and provide a general indication of changes in the level of commercialisation activity over time.

Report Findings

The report identified some trends in the level of commercialisation research in Australia, which on the whole are positive. Across the period 2000 – 2002:

- More staff were employed by research institutions for the purpose of research commercialisation and commercialisation support activities
- The number of inventions disclosed increased, although there was a slight decline in the number of new patent applications made and a dramatic decrease in number of patents issued
- Licensing activity has remained strong
- Gross licensing income reached a peak of $85.59 million in 2002
- The formation of new start-up companies continued at a high level

The growth in number of staff engaged in commercialisation activities provides an encouraging sign that our research institutions are increasing their focus on commercialisation activity.

Over the period 2000-2002 the survey reported an overall upward trend in the number of staff employed for the purpose of commercialisation and support activities, indicating an increased willingness to provide resource for this important activity.

However, these increases were largely among institutions with existing commercialisation capability. Many institutions continue to provide no resource for research commercialisation, with 9 universities, 21 MRIs and 23 CRCs not

R1: *Strategies to provide resources to institutions with no commercialisation resource must be put in place if we are to ensure we derive optimal commercial return from our total research effort.*

reporting employing any staff in these activities.

On the other hand, results indicate that a large proportion of this activity is attributed to a small proportion of respondents.

Overall, there was an increase in the number of **invention disclosures** received over the period 2000-2002. This activity, however, was concentrated in a number of high performing institutions. For instance:

- In 2001 and 2002, 3 universities accounted for 47% and 48% of total university disclosures respectively, with a single university accounting for 19% and 18% of total disclosures respectively. Nine and 11 universities respectively reported no disclosures.

- In 2001 and 2002, a single MRI accounted for 54% and 42% of disclosures respectively. 22 and 23 respectively reported no disclosures.

- For the period 2000-2002, there was a significant downward trend in the number of invention disclosures reported by CSIRO.

- In 2001 and 2002, a single CRC accounted for 77% and 79% of disclosures respectively, with 35 and 40 centres respectively reporting no invention disclosures.

***R2**: A rigorous definition of what is to be recorded as an 'invention disclosure' to be developed in consultation with key institutions prior to the collection of future data. This definition might be developed with reference to the criteria for recording disclosures in place at institutions recording high levels of disclosures.*

***R3**: A mechanism for implementing IP audits and recording invention disclosures for institutions showing low levels of reporting of invention disclosures relative to their research expenditure.*

There is anecdotal evidence to suggest that institutions use different criteria for defining invention disclosures, meaning there are varying levels of rigour in admitting inventions to this status. Further, some institutions do not have good procedures in place for recording disclosures, resulting in the reporting of artificially low levels of disclosures. These factors may, in part, account for the extreme levels of variability between institutions.

There was a decrease in **patenting activity** over the period 2000-2002. This may be interpreted to mean that there are fewer disclosures worthy of patenting coming forward, but is more likely to reflect increased discernment in determining whether patenting is the most appropriate form of protection for the IP asset.

Again, patent activity was concentrated in a number of high performing institutions, for instance:

Patent applications

- In 2001, 5 universities accounted for 254 (63%) and in 2002, 265 (57%) of all university patent applications
- 10 universities either filed no patent applications or did not provide information about patent applications filed

- 3 MRIs accounted for 44 (54%) in 2001 and 44 (46%) in 2002 of all MRI patent applications
- 19 MRIs either filed no patent applications or did not provide information about patent applications filed

***R4**: A metric that tracks the progress of patents through downstream commercialisation activities to be implemented in future surveys to allow analysis of the commercial validity of the patenting decision.*

- In 2001, 28 CRCs either filed no patent applications or did not provide information about patent applications filed, and in 2002 this number increased to 30.

Patents issued

- In 2001, 3 universities accounted for 70 (69%) and in 2002 for 76 (62%) of all university patents issued
- In 2001, 19 universities and in 2002, 20 universities were either issued no patents or did not provide information about patents issued.

- In 2001, 24 MRIs and in 2002, 28 MRIs either were issued no patents or did not provide information about patents issued.

- CSIRO was issued 257, 150 and 148 patents in 2000, 2001 and 2002 respectively.

- In 2001, 39 CRCs and in 2002, 36 CRCs were either issued no patents or did not provide information about patents issued.

For the 45 institutions that responded to each survey in 2000, 2001 and 2002, results show a substantial overall reduction in the number of patent applications made during the period, with a total of 587 applications made in 2002 compared to 813 applications in 2000. There has been a dramatic decline in the overall number of patents issued, with patents issued in 2002 being 55 per cent of those issued in 2000[1].

Anecdotal evidence suggests that this decline may be the result of more discriminating patent practices in our research institutions resulting in the pursuit of patent protection for only those research outcomes for which these strategies are necessary to obtain an optimal commercial outcome. It may also be due to institutions seeking to delay disclosure until later in the process, when more value may be potentially realised. The apparent decline of vanity patenting may be a sign of increasing discrimination in Australia's commercialisation offices.

Although there is a decline in the level of patenting activity, there is an overall upward trend in the number of start-up companies formed by the universities and MRIs. The survey found that 138 start-up companies were formed in the period 2001-2002. The decline in patents but increase in start-up companies, particularly in comparison with US data, may perhaps suggest that a lot of start-up companies are formed with a single (or no) patent.

Government programs are often the only source of funding to very early-stage projects on the commercialisation pathway. However, they can have unintended consequences in skewing outcomes. For instance, COMET funds are only made only made available (for example, to develop proof of concepts) to incorporated entities. As a result, a (start-up) company must be created for a patented idea to attract capital from the COMET scheme. However, is this really a desirable outcome? Individual small companies face considerable risk, suffer a lack of scale, and incur additional costs. Should the company eventually fail, it may cause the IP to be lost entirely, since once transferred outside the confines of a research

[1] This decline may be due to the initial reporting of patent applications filed worldwide, rather than only Australia and the US by some respondents. Overall figures for patents issued in 2001 and 2002 dropped significantly when corrected figures were supplied. This error may potentially have also been made in the Year 2000 survey.

institution it is difficult to reclaim should the start-up company not survive. CSIRO has bucked this trend, perhaps focussing on value and ignoring COMET funds – it created four times fewer companies formed in 2000 compared with 2004.

The majority of **licensing activity** was also largely attributed to a minority of institutions.

- In 2001, 4 universities accounted for 89 (50%) and in 2002, 5 universities accounted for 145 (64%) of all university licences
- In 2001, 11 universities and in 2002, 16 universities either did not execute any licences or did not provide data about licences executed.
- In 2001, 24 and in 2002, 23 MRIs either did not execute any licences or did not provide data about licences executed.
- In 2001, 33 and in 2002, 35 CRCs either did not execute any licences or did not provide data about licences executed.

***R5**: A matching exercise to be undertaken to determine if those institutions with low levels of licensing activity are also characteristically under resourced in terms of commercialisation FTEs to be undertaken. This information to feed into the development of a strategy for resourcing these underperforming catchments.*

The survey results indicate no significant upward trend in **research funding received from licensing** for respondents to the 2000, 2001 and 2002 surveys. However, overall the amount of research funding generated as a result of licensing activity is substantial, with more than $59 million generated in 2001 and more than $76 million generated in 2002.

***R6**: This critical metric to be given greater prominence in future surveys and promoted as a tangible short term benefit of commercialisation effort.*

Income from licences

- In 2001, 3 universities accounted for 82% and in 2002 for 80% of all university licence income
- In 2001, the highest level of adjusted gross income received from licences by a single university was $27.5 million, which

***R7**: Median values for licensing income to be presented in future survey reports to limit dominance by one single artefact in commercialisation activity.*

represents 62% of all adjusted gross income received from licences by universities, in 2002 a single university accounted for 60% of total income

- In 2001, 15 universities and in 2002, 14 universities either received no income or did not report their income from licences.

- In 2001, 21 MRIs and in 2002, 20 MRIs either received no income from licences or did not report their income from licences.

- In 2001, 34 CRCs and in 2002, 40 CRCs either received no income from licences or did not report their income from licences.

Overall, there was a small increase in the amount of **institutional equity** held by respondents to the 2000, 2001 and 2002 surveys. In both 2001 and 2002, universities accounted for 70% of total institutional equity holdings.

International Comparisons

The long-held view that Australia's performance in converting research into commercial outcomes falls short of that in other countries is not entirely supported by the comparative data generated as part of the report. However, it requires more detailed analysis of the data to reveal this, as only a handful of institutions are comparable to US or UK performance.

This survey report plays an important and critical role in helping Australia track our performance and comparing us with international counterparts by benchmarking the level of commercialisation activity carried out by Australia's publicly funded research organisations against the US, Canada and the UK, drawing on the results of similar surveys conducted overseas in these countries.

When the data is normalised against research expenditure, the results suggest that Australia's universities:

- execute fewer licences than the USA, Canada and the UK;
- are issued with fewer US patents than USA or Canada;
- earn a greater rate of income from licences than the UK, comparable to Canada but lower than the USA; and
- form more start-up companies than the USA, but less than Canada or the UK.

Overall, and in an international context, Australia's performance at commercialising the outcomes of research in public institutions, as measured by the metrics in this report, is mixed. At face value this suggests that Australia's institutions should focus more on the licensing of IP than creating start-up companies. However, the lack of suitable industry in Australia and, as noted above, the qualifications for COMET funding, mitigate against this trend, which favour the creation of new companies instead.

The AIC believes that licensing is a form of industrial incubation of IP in which the survival rate of the technology, because of the market pull, are much greater. The AIC's TechFast initiative, focussed on matching demand pull with available IP on a national basis, is intended to help improve the rate of licensing.

The fact that Australian institutions issue less patents, but form more start-up companies than in the US (when compared on the basis of research dollar) is indicative of the worrying trend that sub-scale companies are being formed unnecessarily, possibly to attract either Government funding or venture capital.

Another concern is that only a small number of our research organisations account for the bulk of the commercialisation activity reported. The report identifies a number of institutions that are performing at levels well above the average and at or above world best practices. On the other hand, it also clearly identifies that there is a band of institutions that are not generating substantive commercial outcomes. Strategies to allow these institutions to develop their full commercialisation potential must be established to maximise Australia's return from its investment in research and development.

Limitations

With its scope increased to include responses from the CRCs and other research organisations such as AIMS, ANSTO and DSTO, the survey provides a more complete overview of commercialisation activity in Australia than has previously been available.

However, while the survey does provide opportunities to make comparative assessments of commercial practice across the Australian research and

commercialisation sectors, the measures used in the survey tend to focus on levels of commercialisation *activity* rather than on the ultimate *outcomes* of these activities on the Australian economy and labour market. This is a limitation of the AUTM methodology mandated in order to enable international comparisons.

Another major shortcoming of the data mandated is that it does not measure sustainability of start-up companies, nor long-term value creation.

The measures do not capture the full range of commercial benefits flowing from publicly funded research in Australia. For example, they do not encapsulate the benefits to the economy in terms of consultancy work conducted by researchers; research on commercially relevant topics carried out by higher degree students; and the economic contributions made by those with research training who move into industry.

Importantly, in striving to achieve success as measured by the current set of metrics, institutions may strive for short term "successes" that have little relationship to long term social and economic benefit. For instance, behaviour such as pushing up patent numbers by lodging applications for IP with little potential to achieve commercial success or securing large up-front licensing fees at the expense of lucrative future royalty streams may be seen as great success in terms of the current set of metrics, but delivers little in the long term.

Further, the current set of metrics does not measure efforts expended in building linkages between academia and industry or commerce, which will have a striking impact on increasing the relevancy of our research effort. These "soft" metrics are difficult to measure, but cannot be ignored.

Further work on commercialisation metrics is needed and the international commercialisation community shares this view that further work is required to develop commercialisation metrics.

The full report in electronic format is available from the DEST website at http://www.dest.gov.au/highered/commercialisation/nsrc.htm

SNAPSHOT: Commercialisation Survey Results

Summary of Key Findings for 2001-2002[2]

COMMERCIALISATION ACTIVITY	2001	2002
Patent Activity		
Number of inventions disclosed	787	841
Total Australian and US patent applications filed	718	820
Total patents issued worldwide	301	319
Licensing Activity		
Number of licences executed	421	507
Percentage of exclusive licences	45%	37%
Number of licences yielding income	632	675
Licence Income		
Adjusted gross income from licences ($ million)	75.13	78.43
Start-Up Companies		
Number of new start-up companies formed	71	67
Percentage of companies with headquarters in Australia	96%	82%
Number of companies operational at end of the year	120	136
Percentage of companies in which equity was held at end of the year	74%	82%
Equity Holdings		
Value of all equity holdings ($ million)	130.08	123.18

[2] The summary table provides key results for all respondents to the 2001 and 2002 surveys.

Summary of Key Findings for period 2000-2002[3]

COMMERCIALISATION ACTIVITY	Progress	2000	2001	2002
Patent Activity (patents and plant breeder's rights)				
Number of inventions disclosed	▲	527	622	559
Total Australian and US patent applications filed[4]	▼	813	622	587
Total patents issued worldwide	▼	493	261	269
Licensing Activity (licences, options and agreements)				
Number of licences executed	▲	404	374	435
Number of licences yielding income	▲	476	585	585
Licence Income				
Adjusted gross income from licences ($ '000)[5]	▼	95,191	64,738	63,716
Start-Up Companies				
Number of new start-up companies formed	▲	46	61	53
Percentage of companies with headquarters in Australia	▼	89%	95%	81%
Number of companies operational at end of the year	▲	86	110	116
Percentage of companies in which equity was held at end of the year	▲	78%	72%	80%
Equity Holdings				
Value of all equity holdings ($ '000)	▲	104,762	124,235	108,770

[3] The summary table provides key results relating to the 45 institutions that responded to each of the 2000, 2001 and 2002 surveys.
[4] Refer to previous footnote 1.
[5] In year 2000, $50 million in licence income was accounted for by a single transaction.