



Evaluation of TechNZ

**for
Foundation for Research Science and Technology**

Prepared by Infometrics Ltd

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Authorship

This report has been prepared by John Carran and Adolf Stroombergen.

Email: astro@infometrics.co.nz

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EXECUTIVE SUMMARY

This report describes an evaluation of major TechNZ investments, the information being obtained from interviews (mostly person to person) with representatives of companies that have received significant amounts of TechNZ funding over the last decade. The broad objectives of the evaluation were to ascertain:

1. How successful TechNZ investment has been in increasing the competitiveness of New Zealand industries, measured in terms of sales and exports?
2. What factors may have confounded or enhanced any potential successes?
3. What sort of spillover effects to the wider economy may have occurred?

Contribution of TechNZ

All respondents interviewed as part of this evaluation indicated that their companies would lose competitiveness without continual innovation. This is why the firms in our sample have generally received more than one grant over the last decade. The majority of respondents noted that TechNZ funding had enabled their companies to secure a greater market share with new or improved products, and stay there.

Financial benefits

Sixty eight percent of the companies surveyed rated the TechNZ investment as 100% successful. Some companies pointed out that if success was defined in terms of only technical success rather than financial success, the proportion would be higher.

The unweighted average increase in the value of sales is 19.8%, which is the same increase as the average increase in the volume of sales.

The weighted average increase in the value of sales is 16.3%, implying that larger firms enjoyed a somewhat smaller proportional benefit from TechNZ investment than smaller firms.

With most companies exporting close to 100% of their output, it is not surprising that the unweighted mean increase in export value over the sample is also high at 18.2%.

For a few companies in the sample TechNZ funding enabled them to improve their production process, enhancing their competitiveness via lower product prices. These companies achieve benefits from TechNZ by being efficient producers with high volumes and low unit costs.

We estimate that the companies we surveyed have contributed approximately \$160m to GDP per annum over recent years.



The total value of TechNZ investment received by surveyed firms (excluding for research that is yet to generate a return) is \$39.5m. Therefore, based on the estimated value-added a very crude benefit-cost ratio is about four. We calculate that the discounted value of the increment to sales would be \$509m and the discounted benefit cost ratio would be 12.9 based on plausible assumptions, outlined under *Return on investment*

A more robust calculation of the net effect on GDP requires an econometric comparison of companies that received TechNZ funding with those that did not, allowing for possible self selection bias. Strictly speaking one would also have to allow for the deadweight loss associated with the imposition of taxation required to generate TechNZ funds.

Other than higher sales and export earnings, other benefits received from TechNZ funding were brand positioning, skill retention and recruitment, addition of R&D capacity, and credibility in the market.

Opportunities and impediments

Competition and demand are ranked highest by firms in terms of factors that assisted firms to secure benefits from TechNZ investments.

The exchange rate (notably the US/NZ rate) was often mentioned as a significant impediment, although the viability of most firms is not in jeopardy. This reflects the substantial margins earned by firms and, in some cases, natural hedging.

Difficulty in commercialising products or services was mentioned by a number of firms as a substantial barrier to getting the most from new technologies in a commercial sense.

A number of companies mentioned that it was still difficult to compete for skilled people internationally and this was a significant barrier.

Alternatives to TechNZ funding

A number of respondents mentioned that particular R&D would not have gone ahead without TechNZ funding because the ex ante uncertainty associated with it did not make it commercially viable.

Other companies mentioned that R&D would probably have gone ahead, but its scope and level of development would have been reduced. The consequence of this is that their firms would have been less competitive than if they had had TechNZ funding.

Another group of respondents mentioned that they would have been able to access venture capital funding so their companies' R&D would still have gone ahead as planned. However, they indicated that the consequence of this would be that the company would likely be sold overseas eventually.

One large company indicated that R&D that was partially funded by TechNZ would still have gone ahead because it was essential to the company's long-term survival. But the consequence of not having government funding would be much higher levels of debt and/or asset



sales meaning a proportion of the commercial benefits of the R&D would be captured offshore.

Spillover benefits

Few of the respondents we interviewed mentioned spillovers benefits that would meet our definition. Spillovers identified include the generation of new skills ultimately available to other industry firms, raising the awareness of New Zealand among overseas companies as an R&D centre, and raising New Zealand's reputation more generally as a country producing innovative products and services.

Relations with research organisations

On the whole relationships with domestic research organisations were not strong, although many companies did work with universities and sourced graduates from particular universities. Relationships with CRIs are very rare mainly because they are perceived not to be sufficiently responsive to commercial imperatives.

TechNZ processes

In general companies found the application process to be appropriate for the funding amounts received. A number of firms found it helpful in their own planning processes.

There were some firms that consider the applications were too burdensome and change too much from round to round.

Funding criteria

Most respondents suggested that a company's track record (delivery and bang for buck) should be used as the main assessment criterion for funding, with some funding available for new-comers which the Foundation would have to recognise as riskier.

A number of firms felt that those who manufactured in New Zealand are more worthy of government support than those who just earn their income from royalties on software and systems. Others mentioned that there are still considerable benefits to NZ of foreign-owned companies receiving TechNZ funding including maintaining high-skilled R&D jobs in NZ and enhancing NZ's reputation as a good place for overseas companies to base their R&D.

TechNZ staff

Almost all companies were complimentary about TechNZ staff, commenting on their helpfulness in guiding them through processes. A number of companies were very appreciative of the flexibility of staff and TechNZ processes when circumstances changed.



RESULTS OF INTERVIEWS

Objectives

The objectives of this evaluation were to take a sample of firms which have received TechNZ funding for most of the last decade and ascertain:

4. How successful TechNZ investment has been in increasing the competitiveness of New Zealand industries?
5. What factors may have confounded or enhanced any potential successes?
6. What sort of spillover effects to the wider economy may have occurred?

Operationally we measure competitiveness by sales and exports, and we are interested in whether the drivers are output prices, volumes, or input costs.

Establishing the counterfactual

Ideally we wished to ascertain the counterfactual to TechNZ funding – where companies would be now without TechNZ funding. Not surprisingly, this proved difficult to ascertain in practice. Many respondents preferred to think of TechNZ as accelerating the development of the company by a certain number of years. Where this has been the case we have used the firm's growth over recent years to estimate the counterfactual. However, this may not always be valid as in some cases the whole path of a company's development might have been different without TechNZ funding.

In Figure 1 below let the line g represent the growth path of a firm prior to the effects any TechNZ funding. We ask firms to assess the increment in sales (the distance AB) attributable to TechNZ funding at time T – when the investment is delivering results. As all firms were interviewed in the same year (2009), the point T is identical for everyone, but it means that some firms may have more completed projects than others.

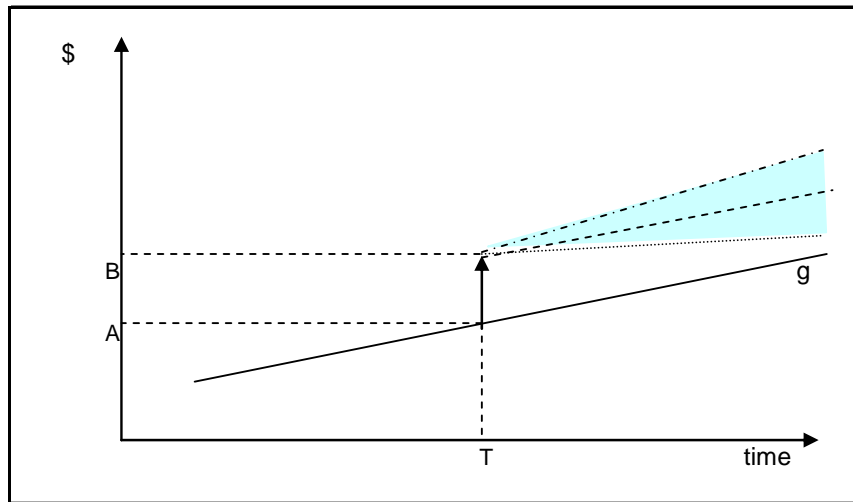
Estimating the size of AB can be difficult for firms to determine, but the real difficulty is assessing the firm's growth path from point T onwards. A number of alternatives may occur:

- There is a temporary boost to sales such that sales eventually return to their 'business as usual' path.
- The growth rate is unchanged, but sales are at a higher level.
- The growth rate itself is higher

These paths are come within the shaded area in the diagram.



Figure 1: Effect of TechNZ investment



A number of firms mentioned that the development of new technology had raised their credibility and allowed them to enter into partnerships with, or be taken over by, large overseas firms. With easier access to large overseas markets and distribution channels this would likely allow them to leverage the commercial benefits of the technologies. In these situations it seems reasonable to assume that the companies would be on a higher growth path for some time. However, without continual innovation the growth path is likely to eventually return to g . This is essentially recognised by the TechNZ process and is why the firms in our sample have generally received more than one grant over the last decade. No firm considered that their growth path would be less than what it was prior to TechNZ investment. On the contrary, the majority noted that TechNZ funding had enabled them to secure a greater market share with new or improved products, and stay there – albeit with continual innovation.

Overall quantified effects from TechNZ

For details see Appendix A.

Success of TechNZ investment

For the 28 companies in the dataset (to date), 68% rated the TechNZ investment as 100% successful. The unweighted average success proportion is 89%, though some companies pointed out that if success was defined in terms of only technical success rather than financial success, the proportion would be higher.

Types of benefits

We asked about various benefits received by firms and the extent to which they were attributable to TechNZ grants, relative to no TechNZ investment. The benefits listed were:



- Sales volume
- Sales value
- Export volume
- Export value
- Lower production costs
- Higher productivity

Effect sizes were classified into:

- Down by more than 25%,
- Down 5-25%
- No major change or within $\pm 5\%$
- Up 5-25%
- Up by more than 25%

The unweighted average increase in the value of sales (the distance AB) is 19.8%, the same as the average increase in the volume of sales.

The weighted average increase in the value of sales is 16.3%, implying that larger firms enjoyed a somewhat lower proportional benefit from TechNZ investment than smaller firms. This point is reinforced by Figure 2: Change in sales value by sales turnover band and Table 1, which show the changes in sales value by turnover band.

Figure 2: Change in sales value by sales turnover band

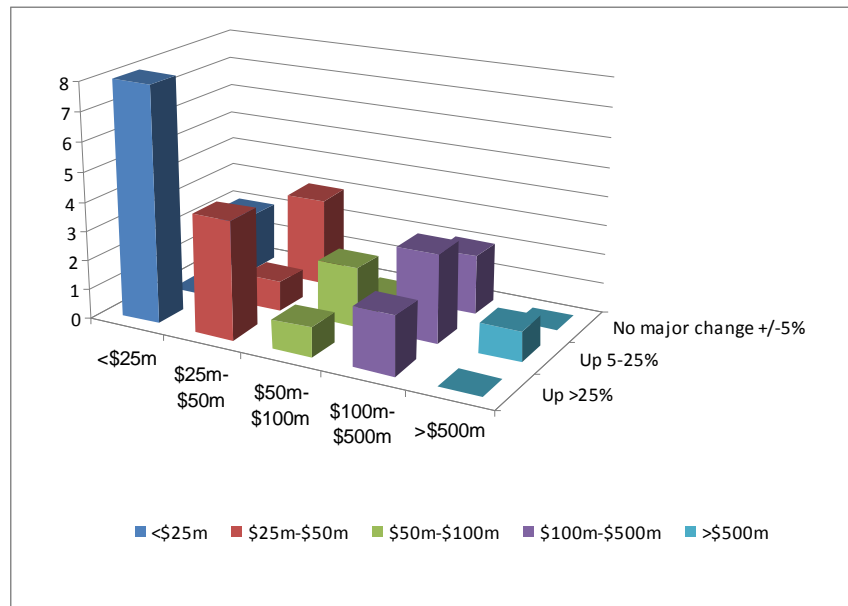


Table 1: Changes in sales value by sales turnover band

	Down >25%	Down 5%-25%	No major change $\pm 5\%$	Up 5-25%	Up >25%
<\$25m	0	0	2	0	8
\$25m-\$50m	0	0	3	1	4
\$50m-\$100m	0	0	0	2	1
\$100m-\$500m	0	0	2	3	2
>\$500m	0	0	0	1	0



With most companies exporting close to 100% of their output, it is not surprising that the unweighted mean increase in export value over the sample is also high at 18.2%.

For a few companies in the sample TechNZ funding enabled them to improve their production process, enhancing their competitiveness via lower product prices. These companies achieve benefits from TechNZ by being efficient producers with high volumes and low unit costs.

See Appendix A for caveats on how these statistics are calculated.

Return on investment

In dollar terms, the size of the sales increment AB for the firms in the sample is estimated at \$325m. This is not a value-added figure as it includes the value of intermediate inputs such as energy and raw materials used in production. For instance Cubic might use products made by Rakon, so the value of the Rakon products would be double counted in a tally of sales.

Value-added covers the return to capital and labour, plus some indirect taxes. In most industries, especially service industries, value-added (contribution to GDP) accounts for more than 50% of gross output. Thus we may infer that the companies in the dataset have contributed approximately \$160m to GDP per annum over recent years.

In comparison, the total value of TechNZ investment received by these firms (excluding for research that is yet to generate a return) is \$39.5m. A very crude benefit-cost ratio is therefore 4.1. If:

- the benefits lasted for only five years,
- all the TechNZ investment occurred in one year – say three years before delivery of output,
- and assuming a discount rate of 10%,

the discounted value of the increment to sales would be \$509m and discounted benefit cost ratio would be 12.9.

The total value of the increment in sales of \$325m is dominated by Fisher and Paykel (F&P), which is much larger than the other companies in the dataset. Excluding F&P the weighted percentage change in sales is actually a little higher at 17.1% (compared to 16.3% with F&P included), but the ratio of the value of the change in sales to the total value of TechNZ funding is only 3.0, compared to 4.1 with F&P included.

Note that calculation of the net effect on GDP requires an econometric comparison of companies that received TechNZ funding with those that did not, allowing for possible self selection bias. Strictly speaking one would also have to allow for the deadweight loss associated with the imposition of taxation required to generate TechNZ funds.



Assisting and impeding factors

Firms were asked to rate the following in terms of the extent to which they assisted or impeded obtaining benefits from TechNZ funding. (Note that this question is in the context of firms that have received TechNZ funds; it does not relate to how these factors would have affected the firms had they not received TechNZ investment).

- Demand
- Competition
- Implementation costs
- Supporting tech
- Skilled labour availability
- Raw material availability
- Cash flow, financing
- Exchange rates

The ratings available to respondents were:

- Significantly impeded
- Mildly impeded
- Neither impeded nor assisted
- Mildly assisted
- Significantly assisted.

Competition and demand are ranked highest by firms in terms of factors that assisted firms to secure benefits from TechNZ investments. The latter relates to situations where TechNZ funding has assisted the company to develop a new product, or at least something that has no close substitute in the market. The former relates to situations where TechNZ funding has assisted the company to compete with products in an existing market – not usually by competing on price, but by developing a better product.

Examples of new products or services include those by Rakon, 4RF, Weta Digital, Navico, Applied Research Associates, Harmonics Aotearoa, and Right Hemisphere, while examples of better versions of competitive products include those by Bomac, Endace, WhisperGen, Tiger, Turf, Wellington Drive Technologies, and Fisher & Paykel.

With regard to impediments, the exchange rate (notably the US/NZ rate) was often mentioned as a significant impediment, although the viability of most firms is not in jeopardy. This reflects the substantial margins that firms can earn by supplying unique and/or cost competitive products. In some cases imported inputs provided a degree of natural hedging against exchange rate movements.

A couple of companies mentioned that even though they have reasonable margins on their products and/or some degree of natural hedging, it was difficult to hedge against the very large swings in the exchange rate experienced in recent years, which has hurt their profitability.

However, as one might expect from the sort of firms that have secured TechNZ grants, most do not see long run profitability as dependent on a low New Zealand dollar.



Difficulty in commercialising products or services was mentioned by a number of firms as a substantial barrier to getting the most from new technologies in a commercial sense. One firm mentioned that commercialisation costs were in the order of two times R&D costs. It was mentioned that in many cases the only alternative to was to partner with a larger overseas company.

Although 13 companies mentioned that TechNZ funding had helped them attract and retain skilled staff (see below), a number of companies mentioned that it was still difficult to compete for skilled people internationally and this was a significant barrier.

Value of investment by TechNZ

Other than higher sales and export earnings, various other benefits of TechNZ investing in private companies were mentioned:

- Brand positioning, cited 19 times.
- Skill retention and recruitment, cited 13 times.

(Note that both of the above were listed in the discussion guide as examples.)

- Credibility in the market, which has allowed collaboration or joint ventures with, or sale to, large overseas companies that have aided technical development or commercialisation of products or services, cited 7 times.
- Addition of R&D capacity, cited 6 times.

Appendix A lists a number of other benefits that were cited on one or two occasions.

Other issues and results

Alternatives to TechNZ funding

There were a variety of responses to the question about the availability of TechNZ funding and alternative funding sources. A number of respondents mentioned that particular R&D would not have gone ahead without TechNZ funding because the ex ante uncertainty associated with it did not make it commercially viable. In the opinion of respondents not going ahead with the R&D would have had deleterious consequences in terms of their firm's global competitiveness and growth.

Other companies mentioned that R&D would probably have gone ahead, but its scope and level of development would have been reduced. The consequence of this is that their firms would have been less competitive than if they had had TechNZ funding.

Another group of respondents mentioned that they would have been able to access venture capital funding so their companies' R&D would still have



gone ahead as planned. However, they indicated that the consequence of this would be that the company would likely be sold overseas eventually.

One respondent from a large company said that the R&D that was partially funded by TechNZ would still have gone ahead because it was essential to the company's long-term survival. But the consequence of not having government funding would be much higher levels of debt and/or asset sales meaning a proportion of the commercial benefits of the R&D would be captured offshore.

Spillover benefits

We define spillover benefits as those that flow to the wider industry, sector, or economy as a result of TechNZ funding. Spillover benefits exclude any benefits that accrue directly to the recipient company (i.e. increased sales, exports or productivity, or reduced costs) or flow-on benefits to companies or individuals with which the recipient company transacts as a result of the funding. For example, under this definition spillover benefits would include the generation of new knowledge and skills which are eventually available to companies in an industry or the wider economy to increase their competitiveness. Spillover benefits would not include more employment or demand for the goods and services of local providers by the recipient company as a result of the TechNZ funding.

In our interviews many companies referred to the direct or flow-on benefits of receiving TechNZ funding, such as increased exports, employment or more demand for the goods and services of local businesses. As we suggest, these do not meet our definition of spillovers.

Few of the respondents we interviewed mentioned spillovers benefits that meet our definition. Those that do include:

- The generation of new skills as a result of new technical developments, which are then available to other companies once they leave the TechNZ recipient company. Two respondents mentioned that a number of their employees had left to join or start up other companies using similar technology.
- Raising the awareness of New Zealand as an attractive R&D centre for overseas companies. One respondent mentioned that his company, which is owned by a large multi-national, is probably more pre-disposed to locating its R&D activities here rather than other countries as a result of recent successful TechNZ funded R&D by the company.
- Raising New Zealand's reputation more generally as a country producing innovative products and services.

However, we are unable to verify within the scope of this evaluation the validity or extent of the spillover benefits mentioned.



Relations with research organisations

On the whole relationships with domestic research organisations were not strong, although many companies did work with universities and sourced graduates from particular ones. A number of firms that reported strong collaborations with offshore universities and research institutions. Some companies reported that they would no longer work with commercial research arms of universities because their prices were too high.

Relationships with CRIs are very rare, with reasons including:

- Lack of incentives for CRI to work on problems facing industry, as they have semi-guaranteed government funding.
- Slow process to arrange collaboration
- Not commercial enough – “too many researchers working on unobtainium”
- Firms needed the skills in house
- Too much uncertainty around intellectual property.

One respondent suggested that the Foundation could broker relationships between companies and universities or CRIs.

Application process

In general companies found the application process to be appropriate, although requiring much energy. Many respondents commented that firms should go through such processes anyway as part of their own investment analysis and to demonstrate business cases to boards, as they might for prospective venture capital funding – an oft cited parallel. In a number of cases respondents commented that the TechNZ processes had been a positive discipline on their companies’ own planning processes.

However there were some who felt that that:

- Applications are very long.
- They change too much from round to round, with philosophy shifting with changes in political cycle.
- They require too much granularity. This is particularly difficult for software and systems.
- They were too demanding in the context of the amount of funding available, although others noted the opposite with one person noting that the amount of received was the same as the profit they might make on a \$10m sale – which would take many more hours of work than preparing an application. (We understand that the application process is already less onerous for smaller amounts of funding, but perhaps the thresholds should be revisited.)



- Applicants cannot easily check the progress of the application and talk to reviewers.

Interestingly a few respondents noted that potential investors are more likely to come on board if they can see that the New Zealand government is also contributing.

Some expressed the view that it was not always easy to understand the Foundation's business development model.

Addressing the issue of granularity and application work load, it was suggested on numerous occasions that a better funding model would be for the Foundation to develop long term trust with companies, with auditing every 3-5 years, including gaining customers views.

Funding criteria

Most respondents suggested that a company's track record (delivery and bang for buck) should be used as the main assessment criterion for funding, with some funding available for new-comers which the Foundation would have to recognise as riskier.

One company considers that of the three "ts" - timing, technology, and team – more focus should be on the team and less on the other two. That is, what is the experience and expertise of the team and what is its track record of technical and commercial delivery?

Some companies also felt that those who manufactured in New Zealand are more worthy of government support than those who just earn their income from royalties on software and systems. (We did not discuss the concept of comparative advantage.)

Several respondents expressed the view that the sale of a company receiving TechNZ funding should be restricted so that the full benefits are captured in NZ. However, those respondents we talked to whose companies were foreign owned mentioned that there are still considerable benefits to NZ of their companies receiving TechNZ funding including maintaining high-skilled R&D jobs in NZ and enhancing NZ's reputation as a good place for overseas companies to base their R&D. Of course, benefits will accrue to the New Zealand owner of any company that is sold subsequent to receiving TechNZ funding as the surpluses generated by the funding are capitalised in the company's sale price. Most of these benefits are likely to be reinvested back into New Zealand.

TechNZ staff

Almost all companies were complimentary about TechNZ staff, commenting on their helpfulness in guiding them through processes. A number of companies were very appreciative of the flexibility of staff and TechNZ processes when circumstances changed. During the development and testing stages in particular, technical issues often arise that need to be addressed. It is essential, therefore, that there is some flexibility to



change the scope or direction of R&D to account for this.

Technology development and sales

It was noted by a number of respondents that TechNZ is not well aligned with other support agencies such as NZTE (who have also been useful). Many customers are conservative and cost conscious so it can be difficult to make the initial sales break-through. This is particularly relevant to software.

A dissenting view, however, is that applications must show how the outputs will be marketed, so the success of the grant should not be due to selling problems. Thus there is no real need for FRST and NZTE to work more closely together. The Foundation funds innovation, the company does implementation and commercialisation, and NZTE may assist with access to export markets and marketing.

PGSF or tax credits

Most companies saw public good science funding as New Zealand's substitute for other countries' R&D tax incentives, re-investment allowances, locational subsidies etc. Some see tax deductions as easier to manipulate and not always delivering a net addition to R&D.

On the other hand, others consider them a less burdensome way to deliver R&D incentives, especially where research is riskier and has less precision regarding the nature of end products.



INTERPRETATION

Benefit to firms

From the perspective of the firms that have received TechNZ investments, they have been extremely valuable. In almost all cases the funding has helped to improve the competitiveness of the firm, usually by enabling them to develop products that provide them with an edge in the market, though also by assisting them to secure economies of scale in production.

Coupled with other benefits such as facilitating research and development, and attracting skilled labour, the TechNZ investment has certainly “enhance[d] firms’ technological capabilities and enable[d] technologically capable firms to move towards high-value, technology-based products, processes and services.” (2009 Budget Estimates Vote: Research, Science and Technology, B.5 Vol.II, p30)

Return on investment

It is equally clear that TechNZ investment has lifted the performance of the companies we interviewed significantly above where it would otherwise have been. We estimate the increment at around 16%, with a minimum discounted benefit-cost ratio of twelve.

Of the firms we interviewed smaller firms clearly enjoyed a somewhat larger proportional benefit from TechNZ investment than larger firms.

Analysis of a different type is needed to determine whether the net effect on GDP is positive:

- Econometric analysis that compares firms that received TechNZ funding with those that did not is required to determine whether the additional resources used by TechNZ recipients would have yielded a higher or lower return if used by other firms.
- Assuming that there is a positive incremental effect on GDP, it needs to be netted off against the compliance and administrative costs of the TechNZ scheme, and the deadweight loss associated with the imposition of taxation required to fill the TechNZ pool.
- In addition, other effects would need to be considered such as whether TechNZ funding crowds out private funding (eg, venture capital), or whether it fills a gap that cannot be met by the market.

Connections with research institutions

The lack of use of CRIs and to a lesser extent universities, by companies that receive TechNZ funding is surprising. In some cases this is because their skill set is not suitable. In many cases, however, companies have



tried to work with CRIs, but been repelled by a lack of commercial focus (difficult to engage with, too slow, and a general ambivalence regarding problems that matter to businesses).

One might argue that the role of CRIs is to undertake research and development that is less commercially relevant, or at least less commercially urgent, not to act as the R&D arm of industry. Undoubtedly R&D along a continuum, from blue sky research to applied technology development is desirable in a modern economy, but how much of each should occur is a question for government.

However, when CRIs are turning away commercial work because they have public good funding to do other work, it seems to us that at the margin some shift of funding from CRIs to TechNZ would raise the overall rate of return on public good science investment to the economy.

Impediments

While firms mentioned some impediments to their obtaining maximum benefits from TechNZ funding, none are really amenable to being influenced by the Foundation. A key impediment is the US/NZ rate, but our impression is that the viability of most firms is not threatened. However, the level of the rate and its volatility do impact on profitability.

Difficulty in commercialising products or services is another impediment, but this may be an area where more communication between the Foundation and other agencies, such as NZTE, could lower transactions costs to firms and improve the delivery of assistance.

Spillovers

There is little evidence of significant spillovers from TechNZ investment. More upstream research assistance vehicles such as RFI and NERF provide a wider scope for generic benefits to percolate through other companies within a given industry, or between industries. Given the nature of the application criteria, investment by Tech NZ has tended to benefit particular firms, firms that are not likely to share the resultant technology with competitors, especially those in other countries, which is often the case for companies in our sample as many have no domestic competition.

We have not been able to investigate less observable spillovers such as improving the branding of New Zealand Inc. or enlarging the pool of skilled researchers. They may exist, but to expect significant benefits of this type from TechNZ investment is probably not achievable under current settings.



Application procedures

The application process itself is generally well supported, especially where the size of the potential TechNZ investment is commensurate with the investment by companies in the application process, (although we know nothing about those firms whose applications were unsuccessful).

That said, there seems to be a case for assessing whether a firm's track record should be the main criterion that determines whether funding should be increased or renewed. This would have to be balanced by more performance monitoring against objectives. Some funding for new comers would also need to be set aside.

TechNZ staff

TechNZ staff were uniformly praised by respondents. Many stressed the value of having high quality staff to deal with their applications and reduce the burden on them. One area for improvement mentioned by only a few companies was staff getting a better understanding of the companies' businesses. This would allow a less "tick-the-boxes" process and a process more informed by the project merits and qualities of the team involved. Obviously the extra time and effort required for this approach would need to be balanced with the additional risks that were mitigated or benefits derived from it.



APPENDIX A: INTERVIEW RESULTS

1. Proportion of TechNZ assisted R&D that achieved its objectives

Mean	89%
Proportion of sample with 100%	68%

Some cases of 100% denote full technical success, but not necessarily full commercial success.

2. Types of benefits

This question asked about various benefits received by firms and the extent to which they were attributable to TechNZ grants, relative to no TechNZ investment. Effect sizes were classified into:

- Down by more than 25%,
- Down 5-25%
- No major change or within $\pm 5\%$
- Up 5-25%
- Up by more than 25%

**Table A1: Types of benefits from TechNZ investment
(number of responses)**

	Down >25%	Down 5%-25%	No major change $\pm 5\%$	Up 5-25%	Up >25%	Total
Sales volume			7	7	15	29
Sales value			7	7	15	29
Export volume			8	8	13	29
Export value			9	6	14	29
Lower prodn cost	2	10	17			29
Higher productivity			17	8	4	29
	2	10	65	36	61	

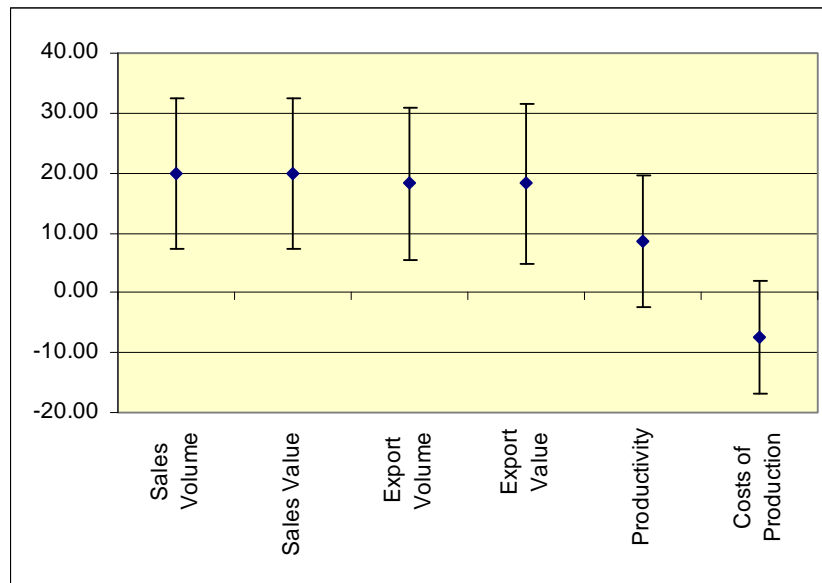
For the purpose of calculating weighted averages we define mid points for the five categories as (-30, -15, 0, 15, 30). Figure A1 shows the mean percentage scores for each type of benefit, ranked from highest to lowest, with the error bars denoting ± 1 standard deviation.

With many companies exporting close to 100% of their output (including royalty and licence income from offshore), it is not surprising to see that sales value and export values are impacted to the same extent. Likewise for sales volumes and export volumes.

That sales values and sales volumes increased by the same amount suggests constant output prices. Coupled with the lower production costs and/or higher productivity, this implies an increase in margins.



Figure A1: Types of benefits from TechNZ investment



For a few companies in the sample TechNZ funding enabled them to improve their production process, enhancing their competitiveness via lower product prices. For those companies volumes rose by more than sales. On the surface this might look like a questionable benefit for New Zealand, but economic benefits are measured in dollars earned per unit of time, not just dollars per unit. An efficient producer with high volumes and low unit prices can make the same contribution to GDP as a niche producer with high unit prices.

In our sample all categories of benefits were proportionally larger for smaller firms than larger firms, as Tables A2-A5 show.

Table A2: Change in sales volume by sales turnover band

	Down >25%	Down 5%-25%	No major change $\pm 5\%$	Up 5-25%	Up >25%
<\$25m	0	0	1	0	9
\$25m-\$50m	0	0	2	2	4
\$50m-\$100m	0	0	0	3	0
\$100m-\$500m	0	0	4	1	2
>\$500m	0	0	0	1	0

Table A3: Change in sales value by sales turnover band

	Down >25%	Down 5%-25%	No major change $\pm 5\%$	Up 5-25%	Up >25%
<\$25m	0	0	2	0	8
\$25m-\$50m	0	0	3	1	4
\$50m-\$100m	0	0	0	2	1
\$100m-\$500m	0	0	2	3	2
>\$500m	0	0	0	1	0

**Table A4: Change in export volume by sales turnover band**

	Down >25%	Down 5%-25%	No major change $\pm 5\%$	Up 5-25%	Up >25%
<\$25m	0	0	2	1	7
\$25m-\$50m	0	0	2	2	4
\$50m-\$100m	0	0	0	3	0
\$100m-\$500m	0	0	4	1	2
>\$500m	0	0	0	1	0

Table A5: Change in export value by sales turnover band

	Down >25%	Down 5%-25%	No major change $\pm 5\%$	Up 5-25%	Up >25%
<\$25m	0	0	3	1	6
\$25m-\$50m	0	0	3	1	4
\$50m-\$100m	0	0	0	2	1
\$100m-\$500m	0	0	3	1	3
>\$500m	0	0	0	1	0

Table A6: Change in costs of production by sales turnover band

	Down >25%	Down 5%-25%	No major change $\pm 5\%$	Up 5-25%	Up >25%
<\$25m	2	5	3	0	0
\$25m-\$50m	0	2	6	0	0
\$50m-\$100m	0	2	1	0	0
\$100m-\$500m	0	1	6	0	0
>\$500m	0	0	1	0	0

Table A7: Change in productivity by sales turnover band

	Down >25%	Down 5%-25%	No major change $\pm 5\%$	Up 5-25%	Up >25%
<\$25m	0	0	2	5	3
\$25m-\$50m	0	0	6	2	0
\$50m-\$100m	0	0	2	0	1
\$100m-\$500m	0	0	6	1	0
>\$500m	0	0	1	0	0

3. Other benefits (Number of times cited)

Firms were also asked about other benefits that could be attributed to TechNZ funding. Note that 'skill retention' and 'brand awareness' were explicitly stated in the discussion guide. Other responses were completely unprompted, but presumably would have been more frequently mentioned had interviewees been so prompted.



Generic Benefit Type	Count
Brand, positioning	19
Skill retention/recruit	13
Collaborations	7
Additional R&D capacity	6
More sustainable business	3
Private investment	2
Leverage to new technologies	2
Enabled enter new markets	2
Shortened time to market	1
Recognition of researchers	1
Public R&D engagement	1
Manufacturing in NZ	1
Market leader	1
Higher product quality	1
Patents	1
Licence agreements	1

4. Factors that impeded or assisted obtaining benefits from TechNZ investment

Firms were asked to rate the following in terms of the extent to which they assisted or impeded obtaining benefits from TechNZ funding:

- Demand
- Competition
- Implementation costs
- Supporting tech
- Skilled labour availability
- Raw material availability
- Cash flow, financing
- Exchange rates

The ratings available to respondents were:

- Significantly impeded
- Mildly impeded
- Neither impeded nor assisted
- Mildly assisted
- Significantly assisted.

For the purposes of calculating a weighted average rating we assign these qualitative ratings numerical values of (-2, -1, 0, 1, 2) respectively. Note that this assumes linearity in the ratings which may not be valid. Figure A2 below shows the average scores ranked from highest to lowest, with the error bars denoting ± 1 standard deviation.

The split between 'competition' and 'demand' is interesting. The latter relates to situations where TechNZ funding has assisted the company to develop a new product, or at least something that has no close substitute in the market. The former relates to situations where TechNZ funding has assisted the company to compete with its products in an existing market – not usually by competing on price, but by developing a better product.

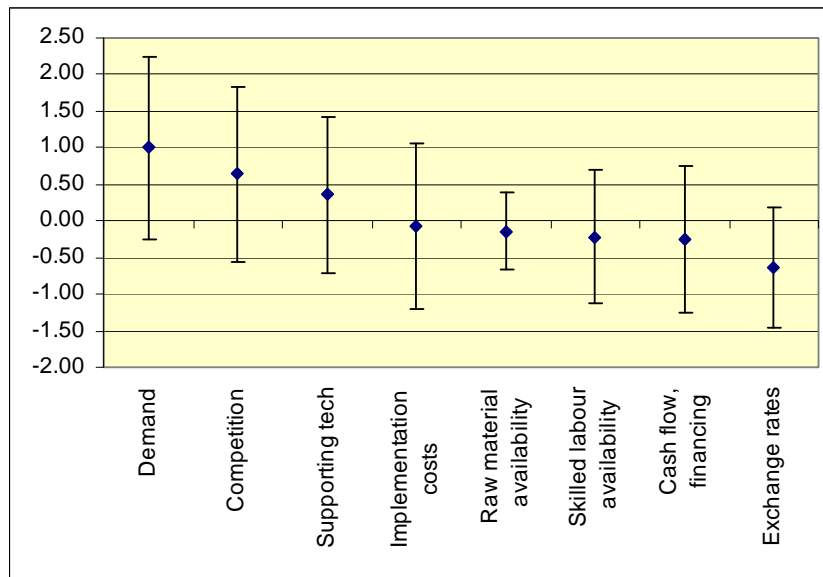


On the impediment side, the exchange rate (notably the US/NZ rate) stands out, although the viability of most firms is not in jeopardy. In other words margins are high enough to buffer the strong (and volatile) exchange rate, albeit that firms do not like it.

Table A8: Impediments and assistance to achieving benefits (number of responses)

	Impeded			Assisted		Total
	Significantly	Mildly	Neither	Mildly	Significantly	
Demand	1	2	10		16	29
Competition	1	4	10	4	10	29
Implementation costs	3	6	14	2	4	29
Supporting tech	1	3	16	3	6	29
Skilled labour availability	3	6	14	6		29
Raw material availability	1	3	24	1		29
Cash flow, financing	4	5	16	2	2	29
Exchange rates	6	6	17			29
	18	34	121	19	40	

Figure A2: Impediments and Assistance to Achieving Benefits



5. Extent of benefits to wider industry (number citing)

Some	11
None, because the company is the industry	13
None, for other reasons	4
Don't know	1



Generally the company that received the TechNZ funds is the industry. With TechNZ investment being company specific, we would not expect much flow-on of technology to other firms in a competitive industry. However, examples of positive effects on the wider industry include providing more trained and experienced people, instilling a stronger R&D culture and higher demand.

6. Extent of close relationships with research organisations (number citing)

Not much	15
Some	9
Substantial	5

'Some' relationship almost always meant with universities or foreign researchers. Involvement with CRIs was almost non-existent, with reasons such as:

- Can't engage with CRIs
- Inappropriate skill set
- Insufficiently commercial
- Too slow
- Hobby horse research agendas
- IP difficulties
- Always looking for "unobtainium"

7. Extent able to access other funds (number citing)

None	17
In house	8
Private investors	5
Lower level of development/delay	9

While the 'None' response ranks highly, some of these applied to the initial TechNZ grant received by the firm in its early stages of development. Once a firm is more established it can more easily access other investors or finance R&D from retained earnings, but this does not mean that TechNZ funding is not valuable. Tapping other sources of funding usually delays the project or else delays some other project. Venture capital funding raises the prospect of eventual sale to a foreign buyer.

8. Contribution of TechNZ staff (number citing)

Very	15
Good/reasonable	12
Somewhat	1
Little	1

The only instance of 'little' was rectified when a new case manager took over.



Companies in Sample

1. 4RF Communications Ltd
2. ABB Ltd (by telephone)
3. Ancare Scientific Limited (formerly Ancare New Zealand Limited)
4. Applied Research Associates NZ Limited
5. AuthorIT Software Corporation Ltd
6. Bomac Laboratories Ltd
7. Cubic (Oscmar International Ltd)
8. CWF Hamilton
9. Designline International Holdings NZ
10. Endace Technology Limited
11. Fisher & Paykel Appliances
12. Formway Furniture Ltd
13. FrameCAD Solutions Limited (previously Metal Forming Technologies)
14. Harmonic Aotearoa Ltd (formerly MediaLab Ltd)
15. Imarda Inc. (previously Prolificx New Zealand Ltd)
16. LanzaTech New Zealand Limited
17. LIC Corporation Limited
18. Navico (previously Navman OEM)
19. NextWindow Limited
20. Orion Health Limited
21. Pultron Composites Ltd (by telephone)
22. Rakon Ltd
23. Right Hemisphere Ltd
24. Robotic Technologies Limited
25. Tait Electronics Ltd
26. Tiger Turf
27. Wellington Drive Technologies Ltd
28. Weta Digital
29. WhisperGen Ltd