



Deepening our understanding of business innovation

Technical report from a study based on
interviews with New Zealand businesses

July 2019





**MINISTRY OF BUSINESS,
INNOVATION & EMPLOYMENT**
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Abstract

This report presents some of the findings of a qualitative study which aims to deepen understanding of business innovation and research and development (R&D) in New Zealand. The study is based on in-depth interviews with a diverse set of 30 New Zealand businesses. This is a companion paper to the main report of the findings from the study, and focuses on the insights for researchers from the overall study. It finds that Stats NZ's Business Operations Survey (BOS) provided a useful basis for selecting the sample for this qualitative study. It also identifies businesses' *own* views of 'innovation' and 'R&D', and provides businesses' interpretations of relevant BOS questions, which should help researchers better interpret some BOS measures about innovation and R&D.

JEL classifications: O31, O38

Keywords: *Innovation, research and development, innovation policy, research and development policy, Business Operations Survey*

Executive summary

Background

This report presents some of the findings from a qualitative study aimed at deepening understanding of business innovation in New Zealand. The overall study explores the meaning(s) of innovation and research and development (R&D) according to firms themselves. Motivations and constraints to innovation and R&D are also examined, along with responses from Stats NZ's Business Operations Survey (BOS). The ultimate aim is to help inform future research and policy about innovation.

The study comprised interviews with 30 New Zealand businesses. The businesses covered a diverse range of industries, sizes, and levels of involvement in innovation and R&D. One common characteristic is that the businesses were generally well established.

This is a companion paper to the main report of the findings from the study. This present report focuses on the insights for researchers from the overall study. In particular, it covers the use of the BOS as a sampling frame for qualitative research, and interviewees' feedback and interpretation of some definitions and questions on innovation and R&D in the BOS.

Use of the BOS as a sampling frame

- **It is feasible to use the BOS for selecting a sample of businesses for qualitative research.** The BOS questionnaire asks whether respondents agree to have some information passed on for the purposes of a follow-up study. This is only the third such follow-up study to be undertaken. We encourage other researchers to consider using the BOS in this way, as we found the quality of BOS data to be high for the purpose of identifying and recruiting a sample of businesses. In this report, we provide some practical advice and learnings based on our experiences.
- **The BOS has several benefits as a sampling frame for qualitative research.** The main benefits are that the survey responses can be used to select businesses with specific characteristics, and the characteristics of selected businesses can be compared with the BOS population as a whole.
- **The main disadvantage is that the BOS excludes very small businesses.** The BOS excludes businesses with less than six employees. This means that if very small businesses are critical to the objectives of a qualitative study, the BOS is probably not appropriate for selecting the sample for that study.
- **Using the BOS as a sampling frame for qualitative research is more relevant to some studies than others,** such as those in which the objectives of the study and sampling approach relate to the BOS in some way. For example, in this study we were interested in businesses' interpretations of some BOS questions.

Interpretation of the BOS

- **Businesses' interpretations of the BOS questions and definition of innovation broadly aligned with their own views about innovation.** Most businesses we spoke with were comfortable with the BOS definition of innovation and felt it accorded reasonably well with their own interpretations, and most said the BOS innovation questions were understandable.

- **However, the businesses we spoke with focused exclusively on product and operational process innovations when they described ‘innovation’.** When we asked businesses an open question about what innovation means to them, essentially they mentioned product and operational process innovations; none mentioned, unprompted, marketing methods or organisational/managerial processes. However, when we ran through businesses’ BOS responses, some indicated that they do undertake these latter two types of innovation.
- **In addition, our findings imply that different parts of the BOS are likely to generate a slightly different overall innovation rate.** We noticed that a number of businesses answered ‘yes’ to the question about innovation in the main module of the BOS, but ‘no’ to each of the individual questions about the four types of innovation in the innovation module (or vice versa). We probed as to why these businesses had responded differently across the questionnaire. There was no single reason given by all businesses, but instead a number of different reasons. The key take-out overall is that a slightly different overall innovation rate for New Zealand will be calculated from different parts of the BOS.
- **There appear to be some caveats with the R&D definition and questions in the BOS.** Definitions of R&D varied across businesses, and some said their own definition of R&D did not align with that in the BOS, or they were uncertain about the definition in the BOS. Some businesses changed their mind or were unsure about their BOS responses about R&D activity, and some suggested that the information they provided on R&D spend in the BOS is very much a rough estimate. In combination, these findings suggest some caveats with the BOS R&D definition and questions. Note, however, that some of the feedback we received about the BOS R&D definition and questions may have been influenced by the consultation process for the R&D Tax Incentive; the fieldwork for our study took place just after the consultation process for the Incentive had closed.

Conclusions and implications

The BOS provided a useful basis for selecting the sample for this qualitative study. We suggest that, where relevant, other researchers should consider using the BOS for similar purposes.

This study should help researchers better interpret some BOS measures about innovation and R&D, as it identifies businesses’ *own* views of ‘innovation’ and ‘R&D’, and provides businesses’ interpretations of relevant BOS questions. The findings imply that care needs to be taken when using the BOS to calculate an overall innovation rate, and when using some R&D measures from the BOS.

Table of Contents

Executive summary	4
1. Introduction.....	7
The study as a whole.....	7
This report.....	7
2. Using the BOS for qualitative research	8
The BOS and qualitative research	8
What we did in this study.....	9
Key learnings	9
3. How businesses interpret questions about innovation and R&D in the BOS	11
Innovation and R&D in the BOS	11
Previous cognitive testing	12
How the BOS is completed.....	12
Innovation question in the main module of the BOS.....	13
Product innovation question.....	13
Organisational or managerial process innovation question	15
Marketing methods innovation question	15
Definition of innovation	16
Differences between responses about innovation across the BOS	16
R&D question in the main module of the BOS.....	17
R&D spend question in the main module of the BOS.....	18
Definition of R&D	18
Technology change question in the main module of the BOS.....	19
Discussion.....	20
Bibliography	21
Appendix A – Executive summary of main report.....	22
Appendix B – Method.....	24
Appendix C – Cognitive testing	32

1. Introduction

The study as a whole

Innovation is a key driver of economic growth. Governments support business innovation and research and development (R&D) in recognition of the widespread benefits from these activities. A recent development in New Zealand is the introduction of a R&D Tax Incentive with effect from April 2019.¹ Future evaluations of the R&D Tax Incentive are likely to draw on information from Stats NZ's R&D survey, and possibly Stats NZ's Business Operations Survey (BOS). In New Zealand, a few quantitative studies about innovation and R&D that have used data from the BOS have had some somewhat surprising results (see for example Wakeman and Conway 2017; Chappell and Jaffe 2018). In particular, they have struggled to find evidence of a relationship between reported innovation and productivity at the firm level.

Qualitative research can shed light on the findings from previous quantitative studies about innovation in New Zealand, as well as deepen our understanding more generally of the state of innovation and R&D in New Zealand. This study takes a qualitative approach.

The study seeks to address the following questions:

- What do 'innovation' and 'R&D' mean to businesses? **How do businesses interpret some questions in the BOS about innovation and R&D (the main focus of this present report)?**
- Why do (or don't) businesses innovate and/or undertake R&D?
- What are the constraints to innovation and/or R&D?
- What more can government do to support innovation and R&D?

The ultimate aim is to inform future research on innovation, and to help MBIE and other organisations design better policies aimed at encouraging innovation.

The study comprised in-depth interviews with 30 New Zealand businesses. We used a 'maximum variation' sampling method, based on the BOS itself, to select the businesses. A maximum variation sample is constructed by identifying key dimensions of variation and then finding cases that vary from each other as much as possible (Suri 2011; Patton 2002). Despite using the maximum variation sampling method, one common characteristic of the 30 businesses was that many were well established; over two-thirds were 20 or more years old.

The fieldwork period was June to July 2018 – almost a year after respondents had completed the BOS 2017 questionnaire. This period was just after the consultation process for the R&D Tax Incentive proposal had closed.

The executive summary from the overall study is contained in Appendix A, and more information on the method contained in appendix B.

This report

This report is a companion paper to the report of the main findings from the study (see Pells and Howard 2019). This present report focuses on the technical findings from the study: what we learnt about using the BOS as a sampling frame for qualitative research; how the sample businesses interpreted some BOS questions and definitions on innovation and R&D.

¹ <https://www.mbie.govt.nz/info-services/science-innovation/funding-info-opportunities/rd-tax-incentive>

2. Using the BOS for qualitative research

This section outlines our experiences and learnings about using the BOS as a sampling frame for qualitative research.

Key findings are identified below.

- The main benefits of using the BOS as a sampling frame for qualitative research are that the survey responses can be used to select businesses with specific characteristics, and the characteristics of selected firms can be compared with the BOS population as a whole.²
- The main disadvantage of using the BOS as a sampling frame for qualitative research is that the BOS excludes businesses with less than six employees.
- Overall, we found the quality of BOS data to be high for the purpose of recruiting a sample.

The BOS and qualitative research

Stats NZ's BOS is an annual survey of around 7,000 businesses with six or more employees and includes questions on a wide range of business practices and performances. It is linked to other datasets in Stats NZ's Longitudinal Business Database (LBD).

The BOS questionnaire asks whether respondents agree to have some information passed on for the purposes of follow-up research – see below.

The screenshot shows a survey question titled "Follow-up research" with a question number "10". The text of the question is: "The Ministry of Business, Innovation, and Employment (MBIE) is interested in doing a follow-up study based on the results of this questionnaire. The follow-up study will help MBIE understand more about the challenges facing New Zealand businesses. Only with your consent can Stats NZ pass on your individual information with contact details attached." Below the text are two radio button options: "1 yes" and "2 no". To the right of the "yes" option is a signature line with the label "(signature of person consenting)" and a small code "D1000". To the right of the "no" option is another signature line with the label "(signature of person refusing consent)".

This follow-up question allows the BOS to be used as a sampling frame for qualitative research by government agencies that help fund the BOS and that want to undertake follow-up research. MBIE is the only agency to date that has used this facility. MBIE previously completed two such studies – one on business strategies and skills (Kaye-Blake et al 2012) and one on international engagement (Deakins et al 2013).

Of the 6,549 businesses that responded to BOS 2017, 1,210 agreed to follow-up research (referred to throughout this report as the 'consent firms').

A key benefit of using the BOS as a sampling frame for qualitative research is that the survey responses can be used to select businesses with specific characteristics. In addition, the characteristics of selected firms can be compared with the BOS population as a whole, which provides some sense of how the sample differs from the wider population of firms. An additional benefit in the context of this present study was that we could access responses from the BOS and ask firms specifically about those responses. This was beneficial in that it allowed us to understand firms' interpretations of some BOS questions.

²Note that we use the terms 'business', 'firm', 'company', etc. interchangeably in this report.

One disadvantage of using the BOS as a sampling frame for qualitative research is that the BOS population does not include very small businesses (with less than six employees).³

What we did in this study

The key steps we undertook for selecting the sample for this study were that:

- we advised Stats NZ that we were undertaking the study, and asked them to send us responses to all the BOS 2017 questions for the consent firms once the responses were available in the LBD – March 2017
- shortly after the BOS 2017 data was available in the LBD, Stats NZ provided us with a spreadsheet of the data for the consent firms – mid-May 2018
- we sent an encrypted password-protected drive containing the consent firms' names to a marketing agency so they could provide data about the consent firms' sizes and industry – mid-May 2018
- once we had received the data back from the marketing agency, we created a matrix of the consent firms based on key variables relevant to this study (size, industry and investment in innovation and R&D – see Appendix B) based on the BOS data and from the data provided by the marketing agency – late May 2018
- we selected a subset of firms within each cell of the matrix – late May 2018
- we e-mailed the selected firms about the study, and then phoned them to recruit the sample – late May/early June 2018.

Key learnings

The main things we learned that may be relevant to others considering using the BOS for the purposes of selecting a sample for qualitative research are identified below.

- **Study objectives and sample.** Using the BOS as a sampling frame for qualitative research is more relevant if the objectives of the study and sampling approach relate to the BOS in some way. For example, in this study we asked some questions about responses to some BOS questions, and we used some BOS questions to select the sample. Using the BOS as a sampling frame for qualitative research is less relevant if very small firms (less than six employees) are critical to the study's objectives and sample.
- **Consent firms versus BOS population.** When we analysed the characteristics of the consent firms compared with the BOS population as a whole, we found they differed somewhat (see Appendix B). In particular, large firms were over-represented in the consent firm dataset, and the retailing and accommodation and cafes industries under-represented. This suggests that there may be some self-selection bias in the firms that agree to follow-up research.
- **Scope of what Stats NZ can provide.** Stats NZ advised us that they could only legally provide us with data covered in the follow-up question ie responses to BOS 2017. Stats NZ

³ The BOS has a number of other restrictions, including that it only targets firms that have an annual GST turnover figure of greater than \$30,000 and that have been operating for one year or more – see http://datainfolplus.stats.govt.nz/Item/nz.govt.stats/98568739-f933-4c00-8d56-d523f20e68bb?_ga=2.82860436.363414137.1547412516-257848139.1541479194#/nz.govt.stats/94981ac0-fc80-4535-862d-142ce19b731b.

was therefore unable to provide us with data on firm size and industry, as the BOS does not include questions about this (even though these data are available in the LBD). This was why we approached a marketing agency to provide these data.

- **Imputed and edited responses.** It is important to ask Stats NZ for the raw BOS data from the consent firms, rather than data with imputed and edited responses. This is because the raw responses may be important for selecting individual firms for the sample. In addition, in this study we were asking firms about some of their BOS responses, so it was important that we had the raw responses.
- **Quality of BOS data for sample recruitment.** We found the quality of data to be comparatively high. The BOS includes the full address of the company, and the name, phone number and e-mail address of the respondent, all of which are useful for the purposes of recruiting a sample. To achieve our final sample of 30 businesses, we contacted 72 businesses. Of the 42 businesses that did not participate, some declined to participate, some were uncontactable (eg they didn't answer the phone) within the timeframe of the study, and some had closed down. Overall, this is in line with – or better than – what we would expect for other sampling frames for qualitative research with businesses.

3. How businesses interpret questions about innovation and R&D in the BOS

This section identifies businesses' interpretation of some questions and definitions about innovation and R&D in the BOS. We asked businesses about their BOS responses after asking them some open questions about what 'innovation' and 'R&D' mean in practice in their businesses. We had a mock-up of the sample businesses' actual responses to some questions from BOS 2017 on hand in the interviews.

Note that almost a year had elapsed since businesses had completed the BOS, so in some instances interviewees' recall was limited. Also note that the fieldwork was undertaken just after the consultation process for the R&D Tax Incentive had closed; the proposed definition of R&D and other design features in the consultation document may possibly have influenced some of the comments from interviewees about R&D definitions and questions in the BOS.⁴

Key findings from our interviews with businesses are identified below.

- Most businesses said that the BOS questions and definition of innovation broadly align with their own views on innovation.
- However, the businesses we spoke with focused exclusively on product and operational process innovations when they described what 'innovation' means to them, despite some of them indicating in their BOS responses that they undertake marketing methods and operational process innovations.
- Some businesses answered the question on innovation in the main module of the BOS differently to the detailed questions in the innovation module.
- Some businesses were less comfortable with the BOS definition of R&D than they were with the definition of innovation.
- Some feedback we received on the R&D questions in the BOS suggests that the findings from these questions should be interpreted with care.

Innovation and R&D in the BOS

The BOS is the primary source of data about business innovation activities in New Zealand, and together with Stats NZ's R&D Survey is a key source of data on R&D activity. The main module (module A) of the BOS questionnaire contains a number of questions about innovation and R&D. Innovation is the specific focus of a two-yearly module (module B), the most recent of which was administered in 2017.

Information about innovation and R&D drawn from the BOS is used for a number of purposes, such as monitoring, research and evaluation. Previous studies include ones that have:

- described innovation and R&D activity (Hong et al 2013; Wakeman and Le 2015)
- identified the effects of innovation and R&D on business performance (see for example Chappell and Jaffe 2018; Wakeman and Conway 2017)

⁴ The definition of R&D proposed in the consultation document for the R&D Tax Incentive (see New Zealand Government 2018) was a narrower definition than that in the final design of the R&D Tax Incentive – see <https://www.mbie.govt.nz/info-services/science-innovation/funding-info-opportunities/rd-tax-incentive>.

- examined the effects of policies on innovation (Jaffe and Le 2016; Ministry for Economic Development 2011).

Previous cognitive testing

Before we started the fieldwork for this study, we asked Stats NZ to provide us with the write-ups from previous cognitive testing that had been undertaken on the innovation- and R&D-related questions in the BOS. The reason was that we wanted to cover new ground in this study rather than repeat what had been done before.

Stats NZ sent us the write-ups from some of its previous cognitive testing. The cognitive testing was undertaken in 2003, and so some of the BOS questions about innovation have subsequently been changed. A summary of the findings is provided in Appendix C.

Key points to emerge from the earlier cognitive testing are identified below.

- Some respondents found it difficult to think about innovation.
- Most respondents found the definition of innovation clear, but struggled with the definition of R&D.
- Businesses in the service sector found it harder to answer some questions compared with manufacturers.
- It was difficult for respondents to provide dollar values for expenditure on innovation.
- If different people within the business were encouraged to complete different parts of the questionnaire, respondents thought this might lower the response rate or lead to differences in interpretation.

How the BOS is completed

We asked interviewees who, within their business, completed the BOS 2017 questionnaire. In the vast majority of cases, it was the person we interviewed (generally the MD or general manager or equivalent, or the Chief Financial Officer). The exceptions were a couple of cases where the person who had completed the BOS questionnaire had moved on from the business, or where the business could not recall who had completed it. A few firms, particularly the larger ones, said that different people within the business completed different modules.

We asked what information was drawn on to complete the BOS. There were two main answers. Firstly, interviewees said they draw on their own general knowledge of the business. Secondly, for some specific questions, they said they draw on financial and other information from their businesses' systems.

Innovation question in the main module of the BOS

22 In the last financial year, did this business develop or introduce any new or significantly improved:

- goods or services
- operational processes
- organisational or managerial processes
- marketing methods?

1 yes

2 no

3 don't know

A2200

The question above about innovation is drawn from the main module (module A) of the BOS.

When explaining their responses to this question, the businesses we spoke with covered many of the same points they had raised when we asked them an open question about what innovation means to them. Many talked about process changes (eg to their IT systems), or about their product developments based on adopting and adapting innovations from elsewhere.

Additional points worth noting are that, when they talked about their answers to this question, some businesses said that:

- they had made several changes in the last financial year (eg introduced a new product *and* improved their processes *and* changed their managerial processes *and* changed their marketing methods). As one Christchurch manufacturer explained:

We're always looking at new ways of doing things. The [product] is growing – sales have quadrupled in three years. Improving our systems and processes. The business has expanded in the past few years, so we've improved on all of these.

- many of the changes they made were incremental or continuous improvements
- in some cases it was difficult to pinpoint the precise timing; for example, if a product or a process change spanned several years, some ticked 'yes' in the year in which the business was working on the main changes, while others ticked 'yes' in the year in which the changes were introduced.

Product innovation question


New goods or services

3 During the last 2 financial years, did this business introduce onto the market any new or significantly improved goods or services?

Don't include the selling of new goods or services wholly produced and developed by other businesses.

1 yes → go to **4**

2 no → go to **7**

Please mark ovals like this 

B0300

The question above is drawn from the innovation module (module B) in BOS 2017.

When explaining their responses to this question, the businesses we spoke with picked up the product innovation-related examples they had provided when we asked them an open

question about what innovation means to them. These examples were often about adopting and refining others' innovative products, or developing the business' own innovative products.

An additional point worth noting is the threshold some businesses applied to 'new' or 'significantly improved' products. For example, a manufacturer answered 'no' to the BOS question about product innovation because it had improved an existing product, and considered the improvements not to be 'significant'. Another manufacturer said that it wouldn't consider that a change in the colour of its products to be an innovation, but that a change in the dyeing process would. An insurance company answered 'no' to the BOS question about product innovation because it had repackaged an existing product for a different market, and did not consider this a sufficiently significant improvement. The key point overall is that businesses' assessment of novelty varied depending on the context.

New to New Zealand/world product innovation question

5 Mark one oval for each item listed. Were any of those new or significantly improved goods or services:

	yes	no	don't know	
new to New Zealand	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	B0501
new to world	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	B0502

The question above is a follow-up question to the one about product innovation from the innovation module in BOS 2017.

Not many businesses we spoke with had responded 'yes' to this question (especially 'new to world'). The main thing we probed on this question was how the business knew whether or not its product was new to New Zealand or (in particular) new to the world. Businesses said that they knew their products were new because:

- of their market research/knowledge of the market/talking to customers (the most frequent response)
- they had a patent for the product
- they had staff on the ground overseas
- they attend conferences and are involved in the academic side of things, and so are aware of the very latest developments
- they went to the government who said they hadn't seen a product like it before.

For example, a large Auckland manufacturer said:

I knew it was new to the world from what I was told by the R&D team. We're aware of the market and what our competitors are doing. We also have papers on our new products [ie patents].

Operational process innovation question

New operational processes

7 During the last 2 financial years, did this business implement any new or significantly improved operational processes (ie methods of producing or distributing goods or services)?

1 yes → go to **8**

2 no → go to **10**

B0700

The question above about process innovation is drawn from the innovation module in BOS 2017.

When explaining their responses to this question, the businesses we spoke with picked up the process innovation-related examples they had provided when we asked them an open question about what innovation means to them. The examples mainly related to IT/computer system changes (eg in relation to quoting, payroll and invoicing systems), and also to some industry-specific processes. The only additional point worth noting is that some businesses commented that they make ongoing improvements to their systems and processes.

Organisational or managerial process innovation question

New organisational or managerial processes

10 During the last 2 financial years, did this business implement any new or significantly improved organisational or managerial processes (ie significant changes in this business's strategies, structures or routines)?

₁ yes → go to **11**

₂ no → go to **12**

B1000

The question above about organisational or managerial process innovation is drawn from the innovation module in BOS 2017.

None of the businesses we spoke with mentioned, unprompted, organisational or managerial process innovation when we asked them an open question about what innovation means in practice in their businesses. However, some had answered 'yes' to this question in their BOS responses. When we asked them to what specifically they were referring, almost invariably it was a managerial change – a new management structure or new managers joining the business. As one Wellington manufacturer explained, *'we brought on some new staff that are taking over managerial positions. Prior to that it was just family'*.

Marketing methods innovation question

New marketing methods

12 During the last 2 financial years, did this business implement any new or significantly improved sales or marketing methods which were intended:

- to increase the appeal of goods or services for specific market segments
- to gain entry to new markets

₁ yes → go to **13**

₂ no → go to **14**

B1200

The question above about marketing methods innovation is drawn from the innovation module in BOS 2017.

None of the businesses we spoke with mentioned, unprompted, marketing methods innovation when we asked them an open question about what innovation means in practice in their businesses. However, some had answered 'yes' to this question in their BOS responses. When we asked them to what specifically they were referring, a couple mentioned that they employed a new salesperson or a marketing consultant. Others said they had developed a website or started using social media to promote their products.

Definition of innovation

2 For the purpose of this survey innovation is broadly defined. It includes the development or introduction of any new or significantly improved activity for this business. This includes products, processes and methods that this business was the first to develop and those that have been adopted from other organisations.

The definition above is drawn from the innovation module of the BOS. We asked businesses about how this definition aligns with their own interpretation of innovation.

Most businesses were comfortable with this definition and felt it aligns reasonably well with their own. A few said this definition is slightly broader than their own. An Auckland retailer stated that the definition *'encompasses most of what we do. I think innovation's about doing something differently that someone else hasn't done'*.

A few others said that people's perspectives about innovation are likely to vary, so it is important to be clear in the BOS about the particular definition required.

Differences between responses about innovation across the BOS

One thing that we noticed while working through businesses' BOS responses about innovation was that a number of businesses had answered 'yes' to the general question about innovation in the main module of the BOS, but 'no' to each of the individual questions about the four types of innovation (product, operational process etc) in the innovation module, (or vice versa). Note that the question in the main module of the BOS relates to the most recent financial year, whereas the questions in the innovation module relate to the last two financial years, and so different responses are potentially valid.

We probed as to why these businesses had responded differently across the questionnaire. There was no single reason given by all businesses, but instead a number of different reasons.

- The business would have had to pinpoint under which specific question in the innovation module its software development fell (and so had answered 'yes' to the question in the main module of the BOS, but 'no' to the specific questions in the innovation module).
- The business would have struggled to answer the set of questions in the innovation module ('new to world', etc) after the one about whether it had introduced a new product (and so had answered 'yes' to the question in the main module of the BOS, but 'no' to the specific question about product innovation in the innovation module).
- Different people within the business completed different modules of the BOS questionnaire, so their judgements could have been different.
- 'Innovation' is described in more detail in the innovation module than it is in module A.
- The question in the main module refers to the most recent financial year, whereas the question in the innovation module relates to the last two financial years (and the change the business had made was in the earlier period) – discussed further below.

The first two of the reasons above imply that the module A question might elicit a fuller picture of innovation than the individual questions in module B.

Following the interviews, we analysed data from the BOS 2017 sample of 6,549 businesses to see how prevalent this issue was in the wider dataset – see Table 1 below.

TABLE 1: DIFFERENCES BETWEEN RESPONSES ABOUT INNOVATION ACROSS THE BOS

		Q22 about innovation in module A # (%)			Total ¹
		Yes	No	Don't know	
The innovation questions in module B # (%)	Yes (to any)	2,343 (35.8%)	834 (12.7%)	54 (0.8%)	3,231 (49.3%)
	No (to all)	648 (9.9%)	2,535 (38.7%)	135 (2.1%)	3,318 (50.7%)
Total ¹		2,991 (45.7%)	3,369 (51.4%)	189 (2.9%)	6,549 (100.0%)

Note: 1) BOS sample

The most plausible responses are highlighted in green in the table above. These are ‘yes’ to both the question about innovation in module A and any of the ones about innovation in module B (36% of responses), and ‘no’ to both the question about innovation in module A and all of the ones about innovation in module B (39% of responses). Also plausible is ‘no’ to the module A question and ‘yes’ to any of the module B questions (13% of responses); this is because, in addition to innovations taking place in the most recent financial year, the module B questions pick up innovations taking place in the financial year before last.

However, the responses highlighted in orange (10%) are highly implausible. These are ‘yes’ to the module A question (which relates to the most recent financial year) and ‘no’ to all of the module B questions (which relate to the last two financial years). In addition, if innovations are undertaken consistently over time, we would expect the proportion of responses in the two cells in the top row to be roughly the same. Instead, the responses imply that respondents are recalling more innovations in the most recent financial year (36%) compared with the financial year before last (13%).

The overall take-out from our analysis is that the innovation rates calculated from different parts of the BOS are likely to be slightly different.

R&D question in the main module of the BOS

Research and development

9 For the last financial year, did this business undertake or fund any research and development (R&D) activities?

Include:

- any activity characterised by originality: it should have investigation as its primary objective, and an outcome of gaining new knowledge, new or improved materials, products, services, or processes
- the buying abroad of technical knowledge or information

Don't include:

- market research
- efficiency studies
- style changes to existing products

1 yes → go to **10**
 2 no → go to **12**
 3 don't know → go to **12**

A0900

The question above about R&D is drawn from the main module of the BOS.

When explaining their responses to this question, the businesses we spoke with covered many of the same points they had raised when we asked them an open question about what innovation means to them. The main themes were that R&D does not mean much to many businesses, as they do not undertake R&D. For the R&D-performing firms we spoke with, R&D tends to mean ‘D’ rather than ‘R’; they are building on their own or others’ previous developments rather than undertaking exploratory research.

manufacturer said that, in the context of its business, R&D is heavily regulated, very structured and about repeatable processes; in contrast, innovation is at the investigative pre-R&D stage.⁵

Some businesses said that the definition did not align with their own definitions, or they weren't sure. A Wellington manufacturer thought that the government treats R&D as an 'academic thing', where 'investigation is the primary objective'. They stated:

What we do – lots of trying and testing – that's R&D too. The Wright brothers wouldn't qualify for a R&D grant because they made something that worked.

Additional comments included the following:

- Government treats R&D as an academic exercise.
- What does 'original' or 'new' mean?
- There are problems with this definition in the software industry, as software development is about applying new knowledge, not gaining new knowledge.
- The definition is about 'R' rather than 'D'. The business' definition would be broader and include new and improved products, as these activities still involve a level of risk.
- 'The buying abroad of technical knowledge or information' is confusing.

Technology change question in the main module of the BOS

24 Over the last financial year, to what degree did this business's technology change?

- 1 not at all
- 2 to a minor degree
- 3 to a major degree
- 4 completely
- 5 don't know

A2400

The question above about technology change is drawn from the main module of the BOS. There were two broad themes about what technology change means to businesses.

Firstly, the most common interpretation of 'technology change' was changes to the business' IT or computer systems (eg quoting, payroll and invoicing systems), or industry-specific processes, as outlined in 'operational process innovation question' above. A Christchurch manufacturer explained that their technological change was:

Mostly around the computing side of the business. Because of the business' growth, it comes down to time. Who's got the time to spend on just one area. So it's incremental improvements. The PCs, software, the accounting system, quoting system.

Secondly, some businesses interpreted technology change as changes to the fundamental technology of their products or industry. For example, a telecommunications company referred to changes in its radio systems. An equipment hire company referred to changes in the technology of the equipment it imports from overseas.

When distinguishing between 'minor' v 'major' v 'complete' changes, businesses generally referred to the extent of the changes in their systems etc. For example, if the business had undertaken a significant upgrade to its IT system, the response was generally 'major', whereas if the upgrades had been less significant the response was 'minor'. This reflects that many of the businesses we spoke with said they undertake a major upgrade of their systems every few

⁵ Note that R&D is one of the activities that support innovation – see OECD/Eurostat (2018).

years, with more modest changes in the interim. Others that had made continuous improvements to their processes had either categorised these as ‘minor’ changes or answered ‘not at all’. One business that had responded ‘major’ had made changes on a number of fronts, each of which were not considered significant individually, but in combination were.

Discussion

The finding that some businesses answer the question on innovation in the main module of the BOS differently to the detailed questions in the innovation module suggests that researchers should exercise care when selecting a BOS measure for New Zealand’s overall innovation rate. The rate calculated from the main module is likely to differ somewhat from that calculated from the innovation module. The reasons that businesses gave for these differences imply that the module A question might elicit a fuller picture of innovation. A further possible implication of our findings would be for Stats NZ to consider re-wording the questions to make them more consistent. For example, having the question wording relating to the most recent financial year might be helpful, given that some businesses appear to have a bias towards reporting their more recent innovations.

The findings also imply that researchers should be careful when interpreting BOS information about R&D activity and spend. This is because businesses’ definitions of R&D varied, some businesses changed their mind or were unsure about their BOS responses about R&D, and some suggested that their responses on R&D spend are rough estimates. While some variation in the interpretation of questions might be expected across survey respondents, in combination (and compared with the more positive feedback about the BOS innovation questions) these factors suggest some caveats with the R&D definition and questions.

There seems to be considerable overlap between businesses’ interpretation of 1) technology change and 2) innovation (especially operational process innovation). There is one proviso to this finding – that when businesses answered our questions on technology change, they may have been influenced by the earlier questions we asked them about innovation. The question about technology change appears in the main module of the BOS among a number of other questions about business performance (exporting activity, providing products on time etc). So when they answered the BOS, respondents were likely to be thinking about technology change in the context of wider business practices. However, when we asked interviewees to think about technology change, it was in the context of this study about innovation and R&D.

Some of our findings – such as that some businesses struggle to define R&D, and the likelihood of responses varying between different people within a business – reinforce the findings from Stats NZ’s earlier cognitive testing. One difference though is that our findings about businesses’ interpretation of innovation tend to be more positive.

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Appendix A – Executive summary of main report

Background

Innovation is a key driver of economic growth. Governments support business innovation and research and development (R&D) in recognition of the widespread benefits from these activities.

This report presents the findings from a qualitative study aimed at deepening understanding of business innovation in New Zealand. The study explores the meaning(s) of innovation and R&D according to businesses themselves. The study also examines businesses' views about the motivations for, constraints to, and government support of, innovation and R&D. The ultimate aim is to help inform future research and policy about innovation.

The study comprised interviews with 30 New Zealand businesses. The businesses covered a diverse range of industries, sizes, and levels of involvement in innovation and R&D. One common characteristic, however, is that the businesses were generally well established.

What do 'innovation' and 'R&D' mean to businesses?

- **Innovation often means adopting and adapting others' innovations.** While some of the businesses we spoke with develop their own novel products and processes, many adopt and adapt ideas from elsewhere. In particular, suppliers of equipment and intermediate goods are a key source of information and innovations.
- **Innovation often means improving operational processes.** System and IT improvements are a key innovation activity for many businesses. Improving production processes is a focus for manufacturers in particular.
- **Businesses tend to think of 'innovation' as product or operational process innovation.** None of the businesses we spoke with mentioned – unprompted – the other two standard types of innovation ie marketing methods or organisational/managerial process innovation. When prompted, some businesses said they do in fact undertake these latter two types of innovative activities. This suggests that these types of activities are not what come to mind when businesses think of innovation.
- **R&D tends to mean 'D' rather than 'R'.** The small number of R&D-performing businesses we spoke with said they undertake product and process developments rather than exploratory research. For example, some software companies said they build on previous developments, either by themselves or others.

What are the motivations for innovation and R&D?

- **Businesses seek a number of benefits from their innovation and R&D activities.** The ultimate aim is to improve the business' bottom line and/or ensure its survival.
- **Competition is a spur to innovation.** For example, exporting manufacturers (and some other businesses) talked about the need to innovate in order to differentiate themselves from overseas competitors.
- **Non-innovating businesses see little reason to innovate.** This may reflect, for example, a lack of competition in a business' industry.

What are the constraints to innovation and R&D?

- **A lack of time, money and staff with the right skills were the most frequently cited constraints to innovation and R&D.** These findings broadly align with those from surveys about innovation.
- **Businesses identified things they themselves can do to overcome the constraints,** such as prioritising innovation activity within their businesses.
- **The constraints to innovation and R&D do not appear to be insurmountable.** This reflects a number of findings, including that despite the constraints to innovation and R&D that many businesses described, most businesses that want to innovate are able to do so nonetheless. In addition, the reason businesses do not innovate appears to be because they consider they have little need to do so, as opposed to facing especially strong constraints.

What more can government do to support innovation and R&D?

- **Around half the sample businesses said they were not aware of any government support available for innovation and R&D.** In particular, some R&D grant recipients appeared to be unaware of the (forthcoming at the time of the interviews) R&D Tax Incentive.
- **Those businesses that were aware of government support appreciate it.** Callaghan Innovation's R&D grants, and especially New Zealand Trade and Enterprise's (NZTE's) services, were generally well received.
- **Businesses believe that government can do more to support innovation.** Their suggestions included that government should:
 - improve the skills system to better meet industry's needs
 - provide more information, including about what government support is available and government's direction and strategies
 - broaden the definition of R&D in the R&D Tax Incentive (note that since the interviews this has happened)
 - ensure that regulations support innovation
 - accelerate the depreciation of machinery and equipment
 - improve and digitise government's own processes.

Conclusions and implications

From a policy perspective, there appears to be an opportunity to raise awareness among businesses of what government support is available for innovation and R&D, as currently awareness appears to be quite low.

Businesses identified a wide range of things that they believe are important in terms of government support for innovation and R&D. In addition, the findings imply that policies in relation to organisational culture, businesses' abilities to absorb ideas from elsewhere, and competition, are important for innovation.

From a research perspective, the findings should help researchers better understand what businesses mean when they report innovation and R&D activities in surveys.

Appendix B – Method

Qualitative research

The study comprised in-depth interviews with a sample of 30 businesses.

In its ability to probe meaning and context, qualitative research is an appropriate tool for addressing the objectives of this study. Qualitative research offers a rich and in-depth understanding of businesses' motivations and behaviours which complements existing quantitative studies.

Sample

We used a 'maximum variation' sampling method. A maximum variation sample is constructed by identifying key dimensions of variation and then finding cases that vary from each other as much as possible (Suri 2011; Patton 2002). This sampling approach fits well with our objectives of identifying what innovation means to different types of businesses, and why businesses in different contexts do/do not innovate.

The dimensions of variation we used to select the sample were 1) business size, 2) industry and 3) investment in innovation and R&D. The first two of these dimensions were chosen because previous studies have found them to be important characteristics associated with businesses' propensities to innovate and conduct R&D (see section 2). The third dimension was chosen as we wanted variation in businesses' exposure to innovation and R&D. We chose investment in innovation and R&D, rather than innovation and R&D activity per se, on the basis that investment in these activities is likely to be more persistent over time than the activities themselves (see section 2).

We used the BOS 2017 as a sampling frame. This was possible because the BOS includes a question about whether respondents would be willing to participate in follow-up research by MBIE. One of the benefits of using the BOS as a sampling frame for qualitative research is that the survey responses can be used to select businesses with specific characteristics and practices. However, one disadvantage of using the BOS as the sampling frame is that the population does not include very small businesses (with less than six employees).⁶

Of the 6,549 businesses that responded to BOS 2017, 1,210 agreed to follow-up research.

Each business that had agreed to follow-up research was coded to various categories within the three dimensions (see categories at the end of this sub-section). The industry and business size information about each business was obtained from a marketing organisation;⁷ information on investment in innovation and R&D was obtained directly from the responses to BOS 2017.

⁶ The BOS has a number of other restrictions, including that it only targets firms that have an annual GST turnover figure of greater than \$30,000 and have been operating for one year or more – see http://datainfolplus.stats.govt.nz/Item/nz.govt.stats/98568739-f933-4c00-8d56-d523f20e68bb?_ga=2.82860436.363414137.1547412516-257848139.1541479194#/nz.govt.stats/94981ac0-fc80-4535-862d-142ce19b731b.

⁷ Note that industry and business size information is available in Stats NZ's Longitudinal Business Database, in which the BOS is contained. However, we were not able to use this information as Stats NZ advised that since industry and business size were not included in the consent question (which covers business name, contact details, and BOS responses) Stats NZ was not legally able to provide that information.

We then selected a small number of businesses within each of the 18 cells in the table below and phoned them to see if they were willing to participate in the research. We contacted the person in the business who had completed BOS 2017; this was possible because the BOS questionnaire requests the contact details of the respondent. Where that person had moved on from the business, we asked to speak to a senior person in the business who was responsible for innovation and R&D and, failing that, the general manager or equivalent.

The aim with qualitative research is to achieve data saturation ie the stage when further collection of evidence provides little in terms of further themes, insights or perspectives (Suri 2011). We chose a sample size of 30 as being likely to achieve data saturation; this proved to be the case for most topic areas, with the possible exception of why firms do not innovate.

We contacted 72 businesses to achieve the sample of 30. 42 either declined to participate, or we were unable to contact them, or they had closed down in the intervening period.

The achieved sample of 30 businesses can be broken down in the various dimensions/categories per Table 2 below. For example, three of the businesses in the sample were small, in a low tech industry, with high investment in innovation and R&D.

		Business size						Total
		Small (<20)		Medium (20-99)		Large (100+)		
Industry	Low intensity	Low Inv 1	High Inv 3	Low Inv 1	High Inv 1	Low Inv 1	High Inv 2	9
	Medium intensity	Low Inv 2	High I 2	Low Inv 1	High Inv 2	Low Inv 1	High Inv 2	10
	High intensity	Low Inv 1	High Inv 3	Low Inv 1	High Inv 2	Low Inv 1	High Inv 3	11
Total		12		8		10		30

Business size categories:

Small (<20) = less than 20 employees in the business

Medium (20-99) = between 20 and 99 employees in that business

Large (100+) = 100 or more employees in that business

Industry categories:

Low intensity = small proportion of businesses in that industry reporting any innovation activity in BOS 2017, and reporting R&D activity, compared with other industries ie:

- A Agriculture, Forestry and Fishing (ex A02)
- B Mining
- E Construction
- G Retail Trade
- H Accommodation and Food Services
- I Transport, Postal and Warehousing
- N Administrative and Support Services

Medium intensity = medium proportion of businesses in that industry reporting any innovation activity in BOS 2017, and reporting R&D activity, compared with other industries ie:

- A02 Aquaculture

- C13 Textile, Leather, Clothing and Footwear Manufacturing, C14 Wood Product Manufacturing, C15 Pulp, Paper and Converted Paper Product Manufacturing, C21 Primary Metal and Metal Product Manufacturing, C22 Fabricated Metal Product Manufacturing
- D Electricity, Gas, Water and Waste Services
- K Financial and Insurance Services
- L Rental, Hiring and Real Estate Services

High intensity = large proportion of businesses in that industry reporting any innovation activity, and reporting R&D activity, compared with other industries ie:

- C Manufacturing (ex C13, C14, C15, C21 and C22)
- F Wholesale Trade
- J Information Media and Telecommunications
- M Professional, Scientific and Technical Services

Investment in innovation categories:

Low Inv (low investment in innovation) = 0 response to Q14 in BOS 2017 ‘activities to support innovation’ (‘done to support innovation’ category), and 0 response Q15 ‘expenditure on product development related activities’.

High Inv (high investment in innovation) = positive response to one or more of the items in Q14 in BOS 2017 ‘activities to support innovation’ (‘done to support innovation’ category), and to one or more of the items in Q15 ‘expenditure on product development related activities’.

Other characteristics of the sample:

- **Innovation/R&D activity:** reported ‘yes’ to Q22 in BOS 2017 about innovation activities (24 out of 30 businesses); reported ‘yes’ to Q9 in BOS 2017 about R&D activity (11 businesses).
- **Region:** Auckland (12 of the 30 businesses), Wellington (seven businesses), Christchurch (six businesses), and other locations throughout New Zealand (five businesses).
- **Age:** 20+ years (21 businesses), 5-19 years (eight businesses), and 1-4 years (one business)
- **Exporting:** non-exporting (18 businesses), and exporting (12 businesses).

Comparison of sample with BOS population

One of the benefits of using the BOS as a sampling frame for qualitative research is that the sample businesses can be compared with the BOS population as a whole. The tables below break down the sample businesses, businesses that agreed to follow-up research, and the BOS population of businesses, by the three dimensions of variation identified above. The key take-out is that, compared with the BOS population of businesses, sample businesses were more likely to be large, in a high tech industry, and investing in innovation and R&D.

Business size category	Achieved sample #	Businesses that agreed to follow-up research # (%)	BOS population ¹ # (%)
< 20	12	582 (48.1%)	30,579 (73.0%)
20-99	8	435 (36.0%)	9,634 (23.0%)
100+	10	193 (16.0%)	1,679 (4.0%)
Total	30	1,210 (100.0%)	41,889 (100.0%)

Note: 1) Observations in the full BOS sample are weighted so that they match the observed industry and firm size distribution of the BOS population.

Industry category		Achieved sample #	Businesses that agreed to follow-up research # (%)	BOS population ¹ # (%)
Low intensity	A Agriculture, Forestry and Fishing (ex A02)	2	93 (7.7%)	3,516 (8.4%)
	B Mining		13 (1.1%)	105 (0.3%)
	E Construction	3	107 (8.8%)	5,070 (12.1%)
	G Retail Trade	1	65 (5.4%)	4,599 (11.0%)
	H Accommodation and Food Services		40 (3.3%)	5,694 (13.6%)
	I Transport, Postal and Warehousing	2	39 (3.2%)	1,554 (3.7%)
	N Administrative and Support Services	1	71 (5.9%)	1,650 (3.9%)
Medium intensity	A02 Aquaculture		1 (0.1%)	24 (0.1%)
	C13 Textile, Leather, Clothing and Footwear Manufacturing, C14 Wood Product Manufacturing, C15 Pulp, Paper and Converted Paper Product Manufacturing, C21 Primary Metal and Metal Product Manufacturing, C22 Fabricated Metal Product Manufacturing	7	74 (6.1%)	1,746 (4.2%)
	D Electricity, Gas, Water and Waste Services		18 (1.5%)	138 (0.3%)
	K Financial and Insurance Services	2	54 (4.5%)	576 (1.4%)
	L Rental, Hiring and Real Estate Services	1	28 (2.3%)	927 (2.2%)
High intensity	C Manufacturing (ex C13, C14, C15, C21 and C22)	3	161 (13.3%)	3,420 (8.2%)
	F Wholesale Trade	2	72 (6.0%)	3,195 (7.6%)
	J Information Media and Telecommunications	2	17 (1.4%)	360 (0.9%)
	M Professional, Scientific and Technical Services	4	187 (15.5%)	4,200 (10.0%)
Total		30	1,210 (100.0%)	41,889 (100.0)

Note: 1) Observations in the full BOS sample are weighted so that they match the observed industry and firm size distribution of the BOS population.

Investment in innovation category	Achieved sample #	Businesses that agreed to follow-up research # (%)	BOS population ¹ # (%)
Low investment	10	481 (39.8%)	20,955 (50.0%)
High investment	20	729 (60.2%)	20,937 (50.0%)
Total	30	1,210 (100.0)	41,889 (100.0%)

Note: 1) Observations in the full BOS sample are weighted so that they match the observed industry and firm size distribution of the BOS population.

Interviews

We interviewed the person within each business who had completed BOS 2017 (where available). This person tended to be the owner, chief executive officer, managing director, general manager, chief financial officer or similar. At the same time, we interviewed (where applicable) the senior person responsible for innovation and R&D – the R&D manager, director of innovation, chief technical officer, chief information officer or similar.

Each interview lasted around one hour.

Most of the interviews were conducted face-to-face in the interviewees' workplaces. This was the case for businesses in Auckland, Christchurch and Wellington. In other locations throughout New Zealand (five businesses) the interviews were conducted by phone.

The interviews were conducted by two MBIE researchers experienced in qualitative research.

The interviews involved us asking the questions in the 'Topic guide' below. For the questions about the BOS, we had available a mock-up of the business' actual responses to BOS 2017.

The fieldwork period was June to July 2018. This timing reflected that firstly, we had to wait until BOS 2017 was in the LBD (May 2018), and secondly, we wanted to complete the fieldwork before BOS 2018 was in field (August 2018). The reason for the latter was that we didn't want interviewees to be confused about to which survey (BOS 2017 or BOS 2018) we were referring.

Analysis and reporting

We recorded and took detailed notes during the interviews. We didn't transcribe the recordings, but instead referred back to the recordings for any points that needed clarifying from our detailed notes and for the verbatim comments.

We undertook a thematic analysis of the data, using NVivo software.

When reporting the findings, we used terms like 'a few', 'many' and 'most' to provide a sense of how prevalent themes were among the sample businesses. Note, however, that as with all qualitative research, no inferences can be drawn about the prevalence of phenomena observed beyond the sample. In other words, the findings cannot be generalised.

Limitations

Some of the main limitations of the method for this study are that:

- the sampling frame (BOS 2017) does not include firms with less than six employees; very small firms' views and experiences of innovation may differ from those of larger firms
- the interviews were conducted almost a year after the interviewees had completed BOS 2017; recall of responses to the survey may be limited
- we only spoke to a small number of firms that never or rarely innovated; the findings in this area should therefore be considered indicative.

Topic guide

Introduction (3 mins)

Thank you for agreeing to participate in this interview. We are researchers at MBIE.

The interview is one of a number being conducted with businesses throughout New Zealand – **both those that innovate and those that don't**. Your responses will be combined with those from other people we are interviewing, so that you and your **business will not be identifiable** in the report that we prepare.

The main topic we will discuss is **business innovation and R&D**. We have the information from the **Business Operations Survey** completed last year. We will ask for a bit more information about your responses to certain questions. There **aren't any right or wrong answers** – we're just keen to better understand what innovation means for your business. If you **can't remember**, that's fine.

Here is a **CONSENT FORM** asking for your formal consent to participate in the interview. Please can you read and sign. Just to help me with my notes, is it ok to record our conversation?

The interview should take **up to one hour**. We will be **keeping time** throughout the interview.

Do you have **any questions** before we start?

Background/context (10 mins)

1. What are your business' **main activities**? [Probe about products and markets]
2. Roughly **how many staff** does your business employ?
3. What is **your role** in the business?
4. What are the main changes in the **operating environment** that affect your business?
5. How would you describe your organisation's **broad business strategy** or business model?
By 'business strategy' we mean the broad approach used to reach your business' goals.

Innovation (5 mins)

6. What does '**innovation**' **mean in practice** in your business? [Probe for what immediately comes to mind in the context of their business/their type of business, and for examples that are in scope and out of scope]
7. And **research and development**? [Probe for what immediately comes to mind in the context of their business/their type of business, for examples that are in scope and out of scope]

Business Operations Survey responses (20 mins)

8. Please can you tell me about **how your business completes** the Business Operations Survey?
 - a) **Who** completes it? [Probe whether interviewee/his or her predecessor]
 - b) **What** information is used to complete it?
9. Turning to your business' **interpretation of some of the questions** in the survey. What do the following mean in the context of your business? [Probe for why they answered BOS in the way they did, and for specific examples that are in/out of scope]
 - a) **Research and development** (Section A, Q9)
 - b) **\$\$\$ spent on R&D** (Section A, Q10)
 - c) **Innovation** (Section A, Q22)
 - d) **Technology change** (Section A, Q24) [Probe for minor v major v complete technology change]
 - e) **New or significantly improved goods or services** (Section B, Q3)? [Probe for new v significantly improved]
 - f) **New to New Zealand v new to world good or service** (Section B, Q5)? [Probe for how assessed]
 - g) **New or significantly improved operational process** (Section B, Q7)? [Probe for new v significantly improved]
 - h) **New or significantly improved organisational or managerial process** (Section B, Q10)? [Probe for new v significantly improved]
 - i) **New or significantly improved sales or marketing methods** (Section B, Q12)? [Probe for new v significantly improved]
10. How does the **definition of innovation used in the survey compare** with what you said earlier about innovation in your business (see Section B, para 2 on page 10 for definition)? And **R&D** (see section A, Q9 on page 4 for definition)?

Business strategy and innovation (10 mins)

11. Picking up our earlier discussion about your business' strategy – what is the **role of innovation** within that strategy, if any? [If innovated – probe for the main triggers for

innovation, the main benefits sought, and whether these benefits have been realised. If not innovated – probe for if the business has ever innovated previously and what the results were]

12. And what is the **role of R&D** in your business' strategy, if any? [If undertaken R&D – probe for the main triggers for R&D, the main benefits sought, and whether these benefits have been realised. If not undertaken R&D – probe for if the business has ever undertaken R&D previously and what the results were]
13. What are the **approximate timelines** for conducting R&D or innovation and seeing the results in your business?

Overcoming constraints (10 mins)

14. What are the **main constraints**, if any, to innovation for your business? And for R&D?
[Cross-refer to Q27 in the BOS]
15. How do you think these **constraints might be overcome**? [Probe for examples of failure, and how these have been overcome]
16. Do you think the **government should have a role** in supporting innovation and R&D?
17. Are you aware of anything the **government is doing** to support innovation and R&D?
18. What **more could the government do**?

Wrap up (2 mins)

Is there **anything else** you would like to say in connection with what we've been talking about?

Appendix C – Cognitive testing

This appendix summarises the findings from some cognitive testing of questionnaires that was undertaken a while ago by Stats NZ.

Almost all the available cognitive testing information came from the predecessor to the current BOS, the Innovation Survey. This included innovation questions as well as R&D questions. There have been minor changes to the questions between 2003 and now, but Stats NZ was unable to find any documented cognitive testing reports for these changes. Thus, the following outlines key considerations based on cognitive testing of the Innovation Survey.

Regarding the question in the BOS asking about change in technology, Stats NZ could not find any documentation at all. Some files were found that performed cognitive testing on module A, but this question was not listed – which suggests that no issues were found with it.

What respondents found the most difficult

Based on a report of two rounds of cognitive testing in February 2003, some respondents made comments about how difficult it was to think about innovation. It is not the way they normally think about their business. There was a lot of thinking required to answer the questions.

Despite the reported difficulty of thinking about innovation, most respondents said the definition was clear. Some clearly just skimmed over the definition.

Some of the other comments were:

- the definition is more related to manufacturing
- most products are the result of iterative/continuous improvements to existing products, so it is difficult to assess if an improvement is significant
- one service provider felt it was not clear, he would think of creating new or improved data bases as innovation.

Hardly any respondents read the R&D definition, which was on another page in the original Innovation Survey. Several respondents had to read the definition twice; even then some people struggled with the concept. One person didn't read the definition, because he said he knows what R&D is.

Other comments about the definition were:

- a little vague
- quite technical
- different from the R&D survey (the respondent said no to R&D survey, but yes here as this has more emphasis on development)
- definition very wide
- well phrased
- close to information management definition.

Services

Although only a few pure service providers were visited, it was clear that it was far more difficult for them to distinguish between product and process innovation.

For a service provider the link between the service (product) and the process is very close: the process often is the service. For instance, if a farmer wants his/her sheep shorn using clippers, the process is now part of the service provided. Does a change in the process, eg better and faster equipment used to deliver the service, mean it is also a service (product) innovation? Or is the service (eg shearing sheep) not changed because the same end-product is delivered (all sheep are shorn within the time required, but maybe now with less people)?

A new product will in most cases result in a new process. A new process may result in a changed product and therefore there is also product innovation. The manufacturers better understood the difference between product and process. Service providers found this far more difficult.

[The current BOS uses the terms 'goods' and 'services', which are less ambiguous than 'product' and 'process'.]

Recall of information relating to 3 financial years

Approximately half of the respondents asked, felt that being asked to supply data relating to three years was too long and one year was better. [Currently, the BOS asks about a two year period.]

Total and detailed innovation expenditure

It was very difficult for the respondents to give the dollar values requested. This information was not stored separately in their books and therefore they could not give accurate answers. Nearly all respondents would estimate it, but they acknowledged that the accuracy would be poor.

More than one respondent

Many respondents would give the questionnaire to their financial person or accountant to answer the questions where dollar values are asked. This increased the risk of non-response, as the questionnaire was moving between people. Will the accountant read the relevant definitions before answering the questions about 'total innovation expenditure' and 'sales value of new products'? Will their interpretation be the same as the respondent answering the other questions?

The respondent of the largest business interviewed had to ask at least four other people for different parts of the questionnaire.

