

# **Interviews with firms on innovation investment**

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Peter Stam

Office for National Statistics, UK

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# Overview

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- Context
- Method
- Characteristics of firms
- Results
- Conclusions
- Next steps

# Context

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- **Recommendation from the revision of the SNA 1993 is to include R&D as an intangible fixed asset:**
  - How do firms classify different forms of R&D?
  - How does long it take firms to develop an R&D project to a usable product / process?
  - What is the average time over which products / processes resulting from R&D benefit the business?
- **Innovation accounting:**
  - How much are firms investing in knowledge / intangible assets?
  - What is the impact of that knowledge investment on growth?
- **Capitalisation of intangible expenditure has implications for levels and structure of GDP and productivity**
- **Additionally we need to take account of “own account” expenditure, where data sources are especially weak**

# Why can't we do innovation accounting on existing data?

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- **National accounts mostly ignores knowledge spend**
  - Most is expensed
  - Surveys not well-developed / non-existent
- **Much effort into R&D**
  - Measured R&D is mostly scientific R&D
  - But innovation is broader and deeper than this:
    - Upstream: design, software, R&D
    - Downstream: business organisation, marketing, training
- **Our work**
  - Measure this “broader” innovation
  - Impact on economy (redo National Accounts and growth record)
  - Better measure of productivity
  - Research into Design sector
  - Pilot interviews with firms

# Method

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- **The purposes of this study were:**
  - To gather answers on R&D asset lives
  - To gather answers on the characteristics and asset lives of other intangible investments
  - To test the feasibility of the study
- **Voluntary survey:**
  - Pilot phase one                      10 Interviews (9 face to face & 1 telephone)
  - Phase two                                30 telephone interviews
- **Feasibility study vs. Data collection objectives**
- **Input from:**
  - National Endowment for Science, Technology and the Arts (NESTA)
  - Organisation for Economic Co-operation and Development (OECD)
  - New Economy Measurement (ONS)
  - Economic Methods (ONS)
  - Surveys and Administrative Sources (ONS)
  - Survey Methodology and Quality (ONS)
  - Jonathan Haskel (Imperial College, London)

# The two sections of the questionnaire

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**A: Technical (R&D) – Spending to resolve scientific and technological uncertainty**

**B: Non-technical (R&D) – Spending to support the commercialisation of new knowledge in your business, or spending to develop new business processes or organisation**

*“We do not distinguish between technical and non-technical like this... all departments are encouraged to work together on a project”*

*“I am the right person to talk to about section A (technical R&D), but section B is too wide ranging for one person to answer”*

*“It is very hard to separate technical and non-technical”*

*“This should be two questionnaires”*

# Characteristics of firms interviewed

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## Two sector split

Major technology sectors (“high-tech”)

*Number of firms: 22*

*Average employment: 820*

*Average technical R&D spend: £15.7mil*

Including:

- Pharmaceutical
- Aerospace
- ICT
- Engineering

Non-technological sectors (“low-tech”)

*Number of firms: 18*

*Average employment: 570*

*Average technical R&D spend: £950k*

Including:

- Consumer goods
- Consumer services

## Six sector split

Manufacturing – Chemical / Pharmaceutical

Manufacturing – Electrical & Communication

Manufacturing – Other High Tech

Manufacturing – Other Low Tech

Services – Finance and Business

Services – Other

# Characteristics of firms interviewed

## Size of firm: Employment

“High-tech” mean:	820
“Low-tech” mean:	566
“All firms” mean:	707
Sample minimum:	< 20
Sample maximum:	> 6,000

## ‘Technical’ R&D spend

“High-tech” mean:	£15.7mil
“Low-tech” mean:	£950k
“All firms” mean:	£11.4mil
Sample minimum:	< £50k
Sample maximum:	> £200mil

## Response rates (ability to provide data)

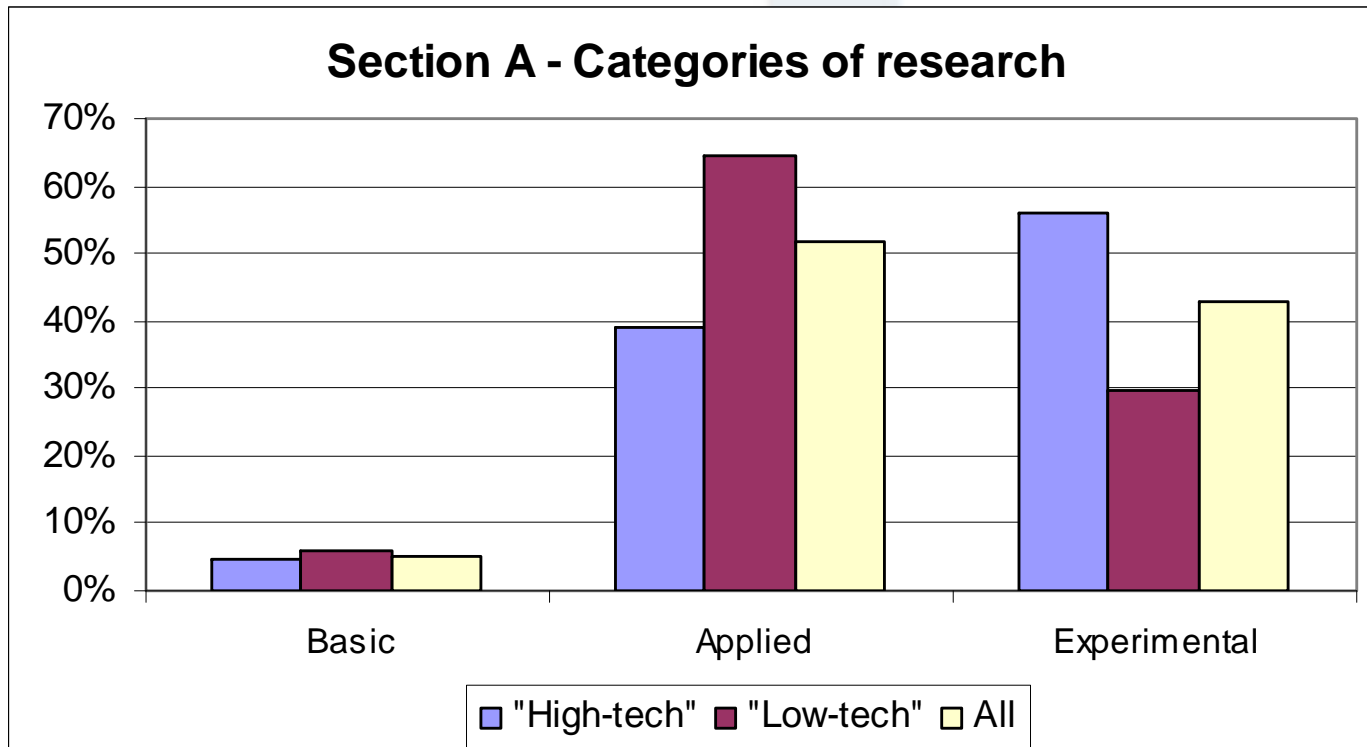
	Part A	Part B
R&D manager	86%	59%
Finance manager	88%	88%
Director	70%	100%

## “Non-technical R&D” spend

“High-tech” mean:	£45.1mil
“Low-tech” mean:	£1.7mil
“All firms” mean:	£22.5mil
Sample minimum:	< £10k
Sample maximum:	> £400mil

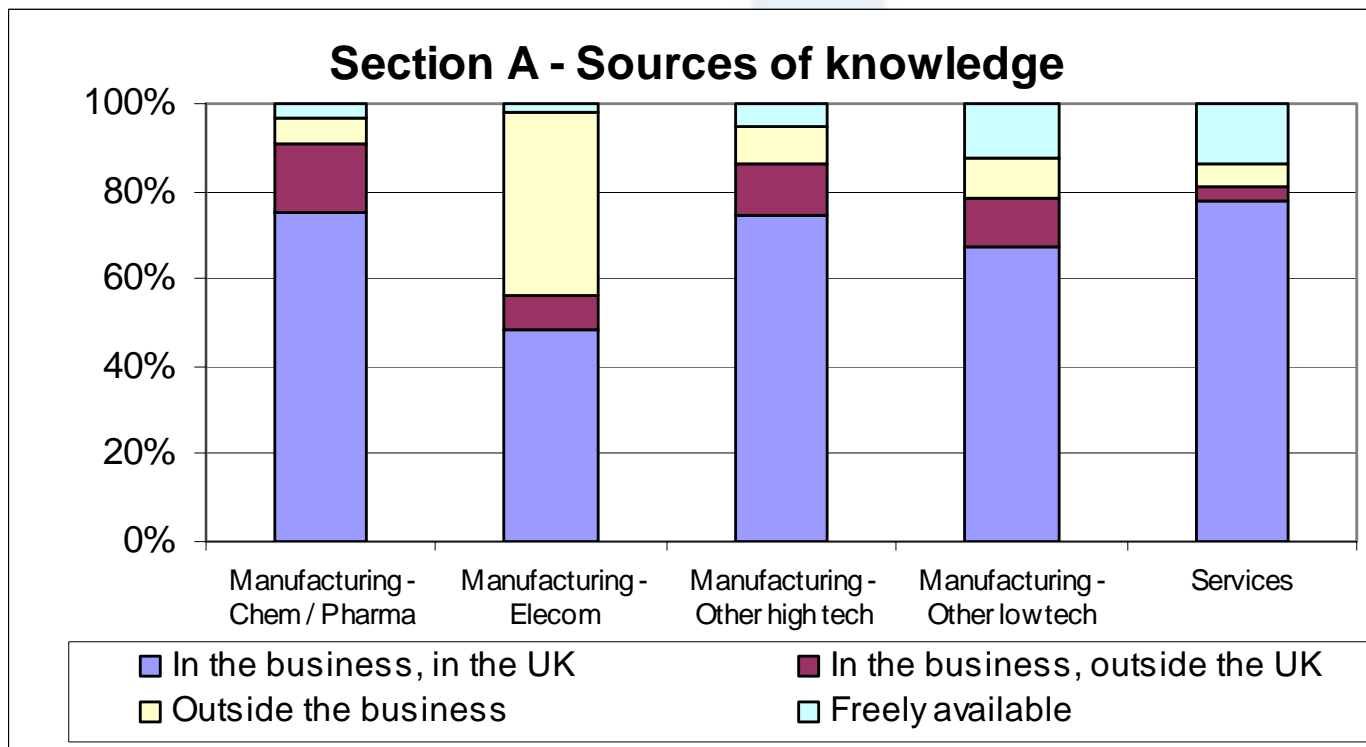


# Section A results – Categories of technical research



- All sectors spend the smallest proportion of their R&D spend on “Basic” research
- High-tech sectors spend proportionately most on “Experimental development”
- Low tech sectors spend proportionately most on “Applied research”

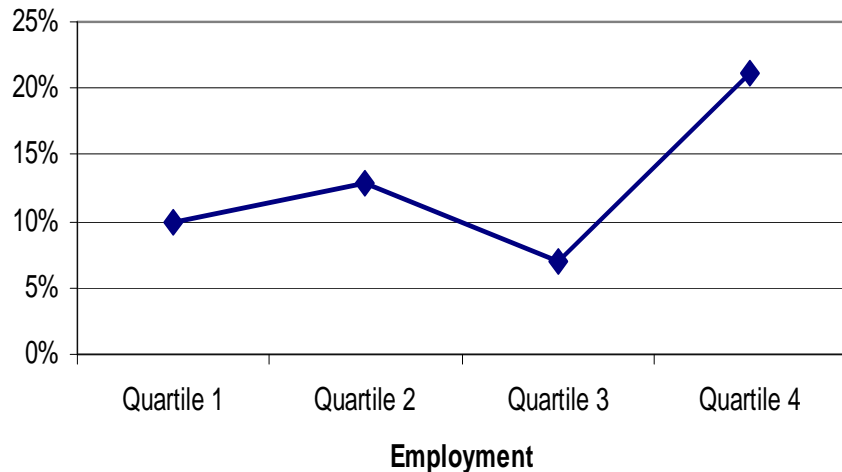
# Section A results – Sources of technical knowledge



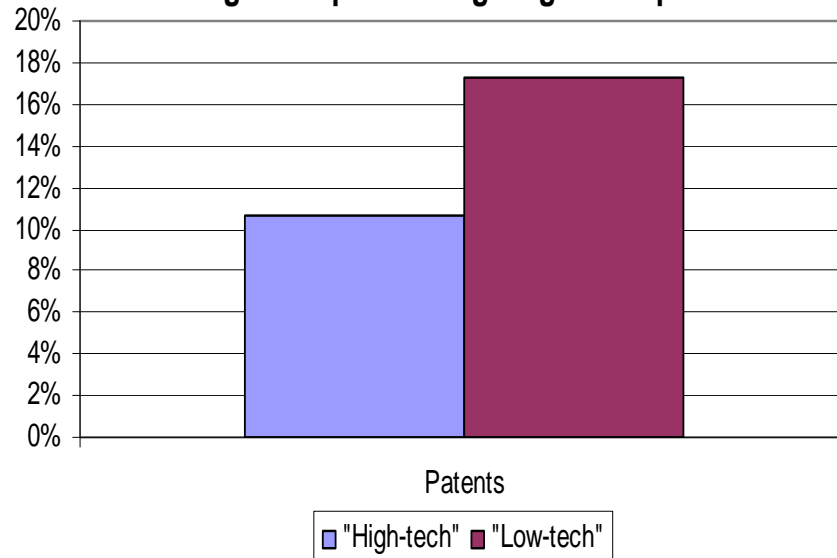
- The average firm sources the large majority of it's technical knowledge from within the firm, in the U.K.
- 'Financial and business services' sector source their technical knowledge only from within the firm in the U.K.
- Of the technical knowledge that is sourced from outside the firms, the majority is in the 'electrical and communications' manufacturing sector
- Most of the freely available technical knowledge tends to flow to the 'other' services sector

# Section A results – Patents (variable response rate)

Percentage of expenditure giving rise to patents



Percentage of expenditure giving rise to patents



*"...don't want to tell people how we do it."*

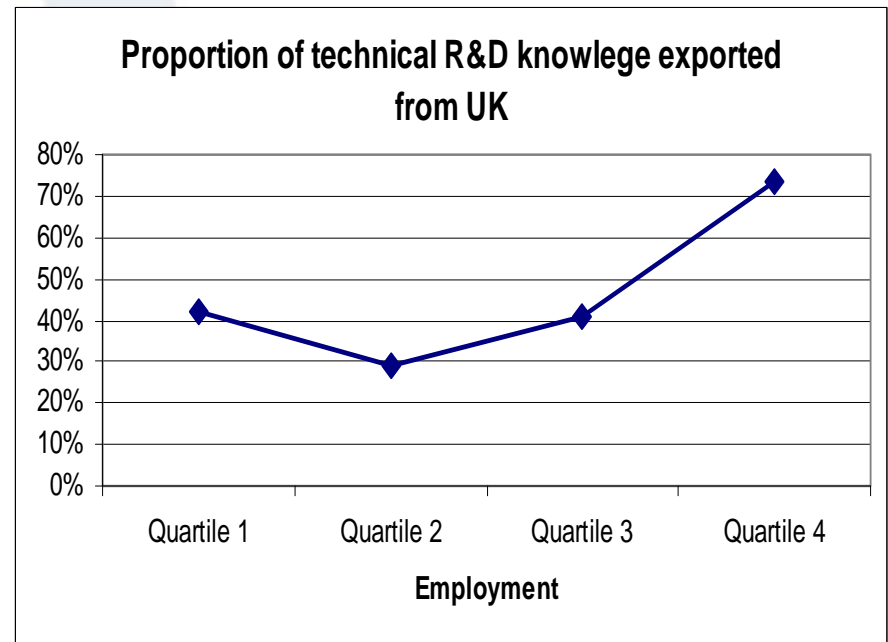
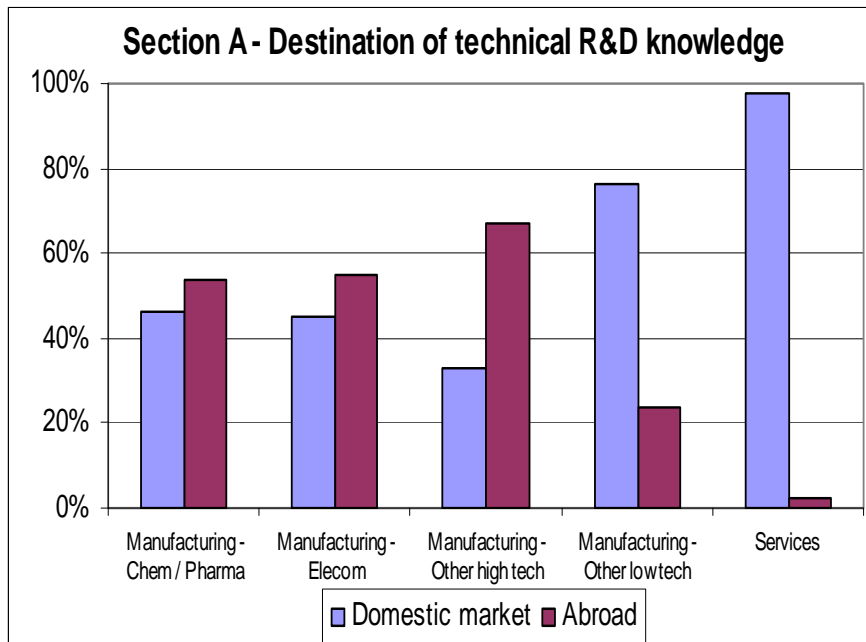
*"...only use patents as a way of differentiating ourselves from our competitors."*

*"...used to patent but it is too expensive now and not worth it. Foreign competitors copy us anyway; luckily they don't do it very well!"*

*"... have an employee confidentiality clause which works better than patents."*

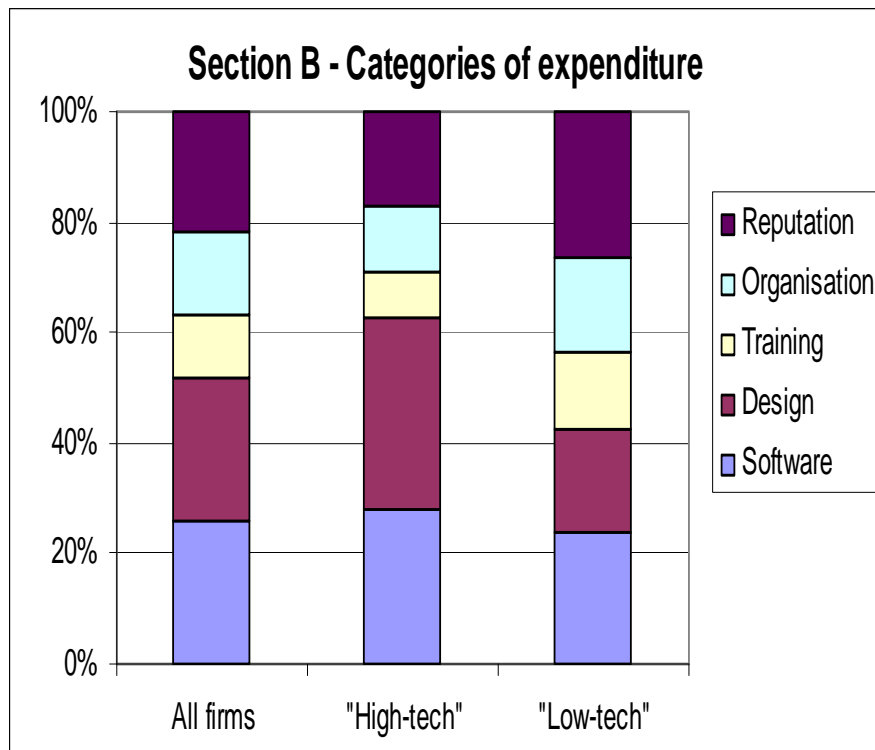
*"... conduct R&D for third parties who will almost certainly patent them, but these don't appear in our books."*

# Section A results – Destination of technical knowledge



- Service and low-tech manufacturing firms focus the majority of their R&D to the domestic market, while the R&D conducted in the remaining three manufacturing sectors is more likely to be used outside the U.K.
- Firms in the largest size quartile (based on employment) are most likely to export their technical R&D knowledge outside of the U.K.

# Section B results – Categories of intangible spending



## Non-technical (R&D)

*“Spending to support the commercialisation of new knowledge in your business, or spending to develop new business processes or organisation”*

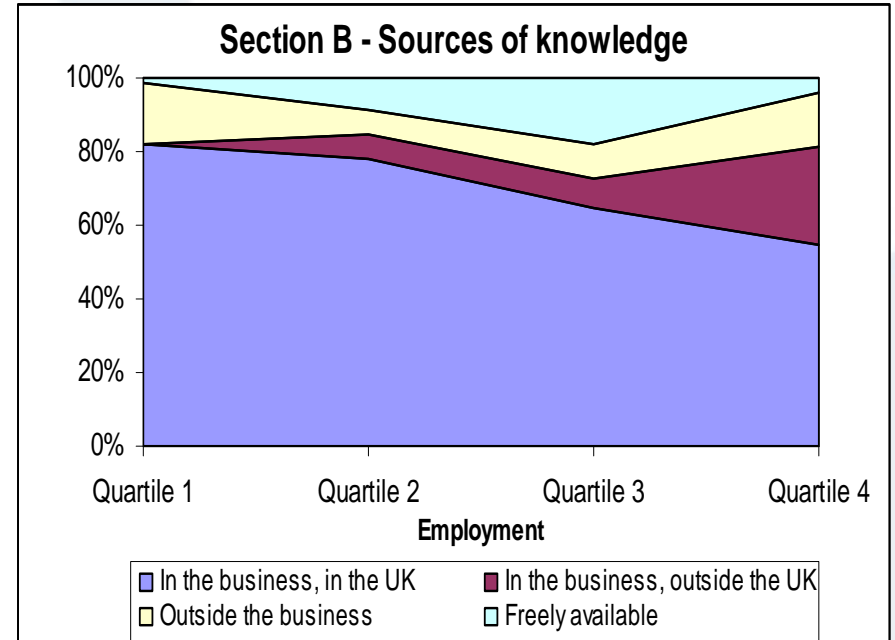
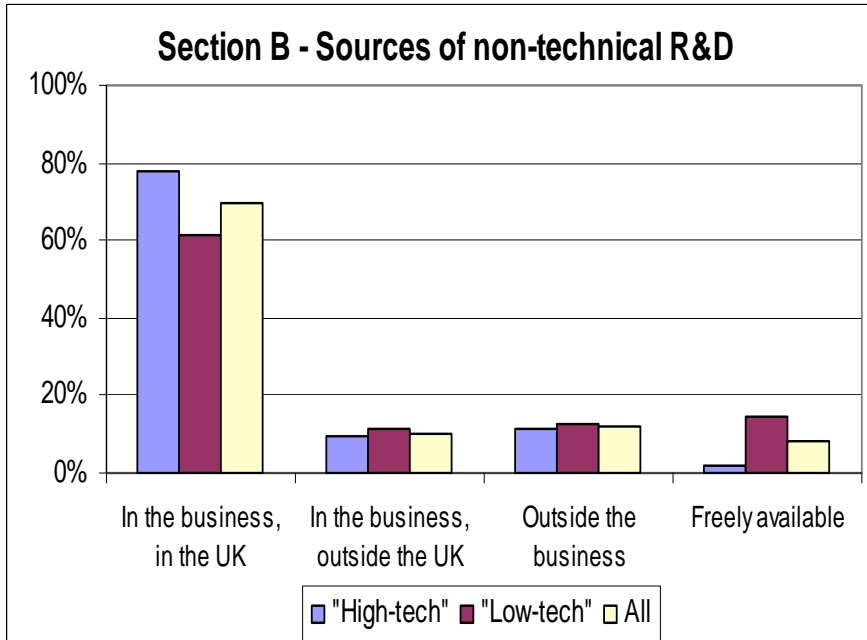
- **Level of activity**
- **Ability to answer with tangible units**
- **Correct interpretation of activities**

*“Some of these activities are answered at group level; I can only speak for this plant.”*

*“The company does these activities but I cannot give you figures here. No one person would know about all of these.”*

*“Some of these activities are very hard to physically measure in terms of pounds and pence.”*

# Section B results – Sources of knowledge



- The vast majority of “non-technical R&D” is sourced within the firm, in the U.K.
- ‘Finance & business’ services sector utilise the most freely available non-technical knowledge
- As firms grow, they tend to utilise more “non-technical R&D” from within the firm, outside the U.K.
- R&D sourced within the business, in the U.K decreases as the size of firm grows

# Section A life-lengths

	Development (years)	Transition (years)	Use (years)	Total (years)
"High-tech"	2.3	1.0	9.9	<b>13.1</b>
"Low-tech"	1.5	0.9	6.0	<b>8.4</b>
<b>Mean</b>	<b>2.0</b>	<b>1.0</b>	<b>8.6</b>	<b>11.5</b>

	Projects
<b>Shorter</b>	16
<b>Typical</b>	42
<b>Longer</b>	9
<b>Total</b>	<b>67</b>

- 'Use' is often interpreted as an anticipated period
- One year "high-tech" development yields **4.3** years use
- One year "low-tech" development yields **4.0** years use

	Development (years)	Transition (years)	Use (years)	Total (years)
Manufacturing – Chemical & Pharmaceutical	4.2	0.9	12.3	<b>17.4</b>
Manufacturing – Electrical & Communication	1.1	0.9	5.6	<b>7.6</b>
Manufacturing – Other High Tech	2.0	1.1	9.8	<b>12.8</b>
Manufacturing – Other Low Tech	1.3	0.9	6.0	<b>8.2</b>
Services	1.1	0.7	4.7	<b>6.5</b>

# Section B life-lengths

	Development (years)	Transition (years)	Use (years)	Total (years)
“High-tech”	0.7	0.7	5.1	<b>6.5</b>
“Low-tech”	0.6	0.3	5.0	<b>5.9</b>
<b>Mean</b>	<b>0.6</b>	<b>0.5</b>	<b>5.0</b>	<b>6.2</b>

	Development (years)	Transition (years)	Use (years)	Total (years)
Manufacturing – Chemical & Pharmaceutical	0.2	0.2	7.5	<b>7.9</b>
Manufacturing – Electrical & communication	0.8	0.6	6.8	<b>8.3</b>
Manufacturing – Other high tech	0.7	0.8	4.2	<b>5.7</b>
Manufacturing – Other low tech	0.6	0.4	6.3	<b>7.3</b>
Services – Finance & Business	0.7	0.6	3.2	<b>4.5</b>
Services – Other	0.5	0.2	4.1	<b>4.8</b>

- 53 projects reported
- One year “high-tech” development yields **7.3** years use
- One year “low-tech” development yields **8.3** years use



# Conclusions – From results

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## Section A:

- High-tech sectors spend most on “Experimental development”
- Low tech sectors spend most on “Applied research”
- All sectors spend smallest proportion of their R&D spend on “Basic” research

## Section B

- High tech sectors spend a lot more on software and design
- Low tech sectors focus on ‘reputation & branding’ and ‘organisational & business process improvement’ (within an smaller total)

## Life-lengths

- Section A (technical R&D) projects are about 46% longer
- Section B (non-technical) projects yield relatively longer ‘use to development’ ratios
- “High-tech” sectors have longer life lengths across all stages

# Next Steps

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- Measuring innovation needs data on
  - Occupations involved in “research” type activities
  - Time spent by those occupations
  - Link between spending on knowledge and investment
  - Life lengths of knowledge investment
- Two main routes
  - Roll out pilot questionnaire to a representative sample of firms
  - Hold expert group meetings with key stakeholders to develop methodology:
    - Design
    - Organizational Capital
    - Human Capital

Peter Stam  
Office for National Statistics  
[peter.stam@ons.gov.uk](mailto:peter.stam@ons.gov.uk)  
01633 455982