



# User Innovation in the UK

contribution to NESTA's Innovation Index

*Sharing best practices in R&D Statistics  
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(Drilling aid device)



## **This talk**

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- **Objectives & Methodology**
- **User innovation by UK firms**
- **User innovation by individual UK consumers**

**We find that user innovation is substantial...  
...generally useful to others (firms, consumers)...  
...and mostly unrecorded in official statistics**

<b>Industrial products</b>	n	% user innovators
<b>Printed Circuit CAD</b> Urban and von Hippel (1988)	136	<b>24.3%</b>
<b>Pipe Hanger Hardware</b> Herstatt and von Hippel (1992)	74	<b>36%</b>
<b>Library IT Systems</b> Morrison et al (2000)	102	<b>26%</b>
<b>Software security features</b> Franke and von Hippel (2003)	131	<b>19.1%</b>
<b>Surgical Equipment</b> Lüthje (2003)	261	<b>22%</b>
<b>Consumer products</b>	n	% user innovators
<b>Outdoor Products</b> Lüthje (2004)	153	<b>9.8%</b>
<b>"Extreme" sports equipment</b> Franke and Shah (2003)	197	<b>37.8%</b>
<b>Mountain biking equipment</b> Lüthje et al (2002)	291	<b>19.2%</b>

*Source: Von Hippel (2005, p. 20)*

## Objectives

Research commissioned by NESTA to contribute to new Innovation Index

Our challenge was threefold:

1. Develop indicators for user innovation
2. Analyse levels of user innovation by user firms and consumers
3. Explore to what extent user innovation reveals 'hidden innovation' not recorded by traditional indicators

# Methodology

## Two surveys

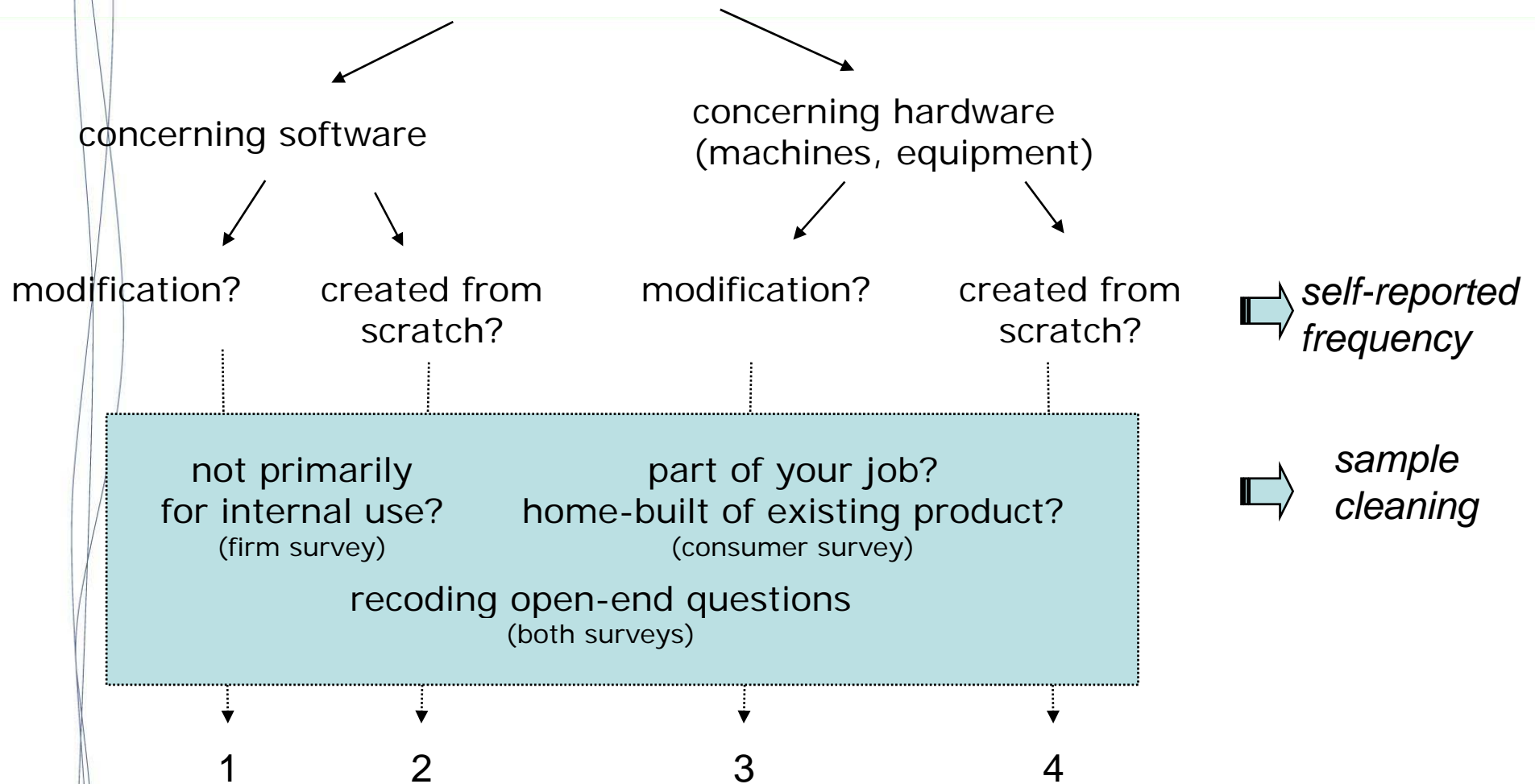
- 1,004 UK firms with 10-250 employees
- 1,173 UK individual end consumers

## Screening procedure:

1. Frequency of user innovation
2. Open-ended questions: what and why
3. More screening questions to exclude 'false positives'

All surveys done by telephone for detailed open-ends

# Measuring user innovation



user innovator = any(1,2,3,4)

user creator = any(2,4)

user modifier = any(1,3)

## Some examples of reported innovations

	<i><b>Valid case</b></i>	<i><b>False positive</b></i>
<b>Modification</b>	I modified a washing machine, where i changed the way the timer worked to give a spin only option. I also bridged one of the circuits and inserted a switch. Due to the weather, I wanted to washing machine to spin only.	I have recently upgraded my PC. I bought a new internal hard drive and upgraded the internal memory. I needed more space for the files in my computer.
<b>Created from scratch</b>	I programmed my own predictive analysis software, designed to provide optimized costs. Doing it manually takes about 4 hours, now only 20 minutes.	I refurbished my old seat cushions, i used new sponge material and repaired it to be new again. As it cheaper to repair it than to buy a new sofa.



## Follow-up questions on specific innovation cases

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- Innovation collaboration
- Expenditures
  - Time (person-days)
  - Money (UK Pounds)
- Protection and transfer
  - Using IPRs
  - Sharing details of the innovation
  - Adoption by other users/firms
- Firm survey: Traditional innovation indicators

## Survey of 1,004 UK firms

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- Firms with 10-250 employees (mirroring CIS)
- Response rate 18%
- Including all commercial industries, e.g.
  - Mining
  - Agriculture
  - Manufacturing
  - Construction
  - Trade
  - Financial services
  - Business services
- Results weighted to obtain population estimates

## 15.3% engages in user innovation

User modifiers (modification of soft/hardware in past three years)	User creators (soft/hardware created from scratch primarily for internal use)		Total
	No	Yes	
- No	84.7%	5.0%	89.7%
- Yes	6.7%	3.6%	10.3%
Total	91.4%	8.6%	100%

- This represents 30,500 firms with 10-250 employees
- This does not include
  - Firms with 1-9 employees (N = 1,000,000)
  - Self-employed (N = 3,500,000)
  - Firms with > 250 employees (N = 6,000)

*Source: Survey of 1 004 UK firms with 10-250 employees, 2009*

## Industry differences are substantial

<i>Industry type</i>	<i>Share of user innovators</i>
Software and IT services	50%
Mining and quarrying	33%
Other Creative Activities	25%
Other manufacturing	23%
Aerospace and automotive	20%
Financial services	19%
Other business services	17%
Wholesale trade	17%
Legal, consultancy and accounting services	15%
Agriculture and fishing	14%
Retail trade & personal services	8%
Transport & communication	7%
Hotels and restaurants	6%
Construction	6%

*Source: Survey of 1 004 UK firms with 10-250 employees, 2009*

## Larger firms are more likely user innovators

<i>Size band</i>	<i>Share of user innovators</i>
10-19 employees	12%
20-49 employees	13%
50-99 employees	24%
100-250 employees	33%

*Source: Survey of 1 004 UK firms with 10-250 employees, 2009*

## Expenditures are substantial

<i>Investment on most recent user innovation</i>	<i>Average</i>
Time investment (person-days)	107
Direct investment other than time (£)	44,500

Conservatively estimated investment in user innovation by UK firms with 10-250 employees = **£ 1.7 bln**

For comparison: in 2007 R&D spending by UK firms with 0-250 employees = **£ 2.6 bln**

*Source: Survey of 1 004 UK firms with 10-250 employees, 2009*

## Comparison with incumbent indicators

User innovator (modification or creation of soft/hardware in past three years)	R&D performer (Frascati)	
	No	Yes
- No	81.8%	2.9%
- Yes	<b>13.1%</b>	2.2%

User innovator (modification or creation of soft/hardware in past three years)	Innovative firm (CIS)	
	No	Yes
- No	39.6%	45.0%
- Yes	<b>4.0%</b>	11.3%

*Source: Survey of 1 004 UK firms with 10-250 employees, 2009*

## Consumers innovate too – but never captured in official statistics





## Survey of 1,173 end consumers

- Disproportionate stratification
- Response rate 17%

gender	female (14%); male (86%)
age	18-34 years (20%); 35-54 years (33%); 55+ years (47%)
employment	employed (74%); retired (17%); not working (9%)
type of education	technical/engineering (32%); business/management (18%); arts (7%); social sciences (20%); other (8%); none (15%)
educational attainment	less educated (15%); high school (28%); further qualifications (25%); university degree (32%)

- Results weighted to obtain population estimates

## 6.2% is a user innovator

User modifiers (modification of software or hard in past three years)	User creators (software or hardware created from scratch primarily for own use)		Total
	No	Yes	
- No	93.8%	1.4%	95.2%
- Yes	4.2%	0.6%	4.8%
Total	98.0%	2.0%	100%

- This represents 2.9 mln consumers aged 18+  
(younger citizens not included)

Source: Survey of 1 173 UK consumers aged 18+, 2009-2010

## Males are more likely to be user innovators

<i>Gender</i>	<i>Share of user innovators</i>
Male	9.6%
Female	3.0%
Oneway F	22.2 (p < 0.001)
Multivariate F (controlling for education level and type)	3.4 (p < 0.10)

*Source: Survey of 1 173 UK consumers aged 18+, 2009-2010*

## Type and level of education matters

<i>Type of education</i>	<i>Share of user innovators</i>
Technical/engineering	14.9%
Arts	5.8%
Business/management	4.9%
Social sciences	2.8%
Other	3.7%
<i>Level of education</i>	
University degree	9.0%
Further qualifications	7.4%
Less educated or high school	4.8%

*Source: Survey of 1 173 UK consumers aged 18+, 2009-2010*

## Again, expenditures are substantial

<i>Investment on most recent user innovation</i>	<i>Average</i>
Time investment (person-days)	4.8
Direct investment other than time (£)	101

Conservatively estimated investment  
in user innovation by UK consumers = **£ 2.0 bln**

For comparison: in 2007 total domestic  
R&D spending by all UK firms = **£ 10.2 bln**

*Source: Survey of 1 173 UK consumers aged 18+, 2009-2010*

# Sharing and transfer of user innovations

<i>Innovation...</i>	<i>Share of user innovators (firms)</i>	<i>Share of user innovators (consumers)</i>
... is shared with others	24%	33%
... adopted by others (e.g., firms, individuals)	23%	17%
... is protected with IPRs	29%	2%
... is perceived to be original (respondent was first)	n.a.	26%

## *Sources:*

*Survey of 1 004 UK firms with 10-250 employees, 2009*

*Survey of 1 173 UK consumers aged 18+, 2009-2010*

## Conclusions

- User innovation is everywhere, not just in case studies
- Investment is substantial; billions of UK Pounds
- Most of it is not recorded by official statistics
- Results suggest that some are more likely to be user innovators
  - and not all innovations diffuse
- Future research (GPEARI-MCTES, FCEE-Católica, MIT, RSM):
  - When and how do user innovations diffuse?
  - What human resources/skills for innovation are needed?  
What individuals/firms become user innovators?
  - Implications for policy?