Central Statistics Office Ireland

ICT MICRODATA LINKING PROJECTS

Brian Ring
Central Statistics Office

Some CSO Background

- CSO runs annual survey of enterprises and households – integration work to date has focussed on data from enterprises
- Enterprise survey generally issued to circa 7,000+ enterprises in March/April – aim to release high level results by Dec
- Coverage: 10+ persons engaged; Generally includes industry, construction (20+ persons engaged); selected services (e.g. excludes financials)
- Response rate generally circa 55+%

Some CSO Background

- Questions include: ICT Systems information (Use of computers, e-workers etc); Use of the internet (Internet connections, interaction with public authorities etc); e-Commerce; Barriers to e-Commerce etc
- Data available from 2002 – please do leverage CSO in terms of maximising data that is available

Some ICT Integration Projects

1. The Impact of ICT on Productivity / Growth - (EUROSTAT)

2. ICT Enabled Innovation(OECD)

1. ICT Impact on Productivity/Growth (Eurostat)

Agenda

- Why was the project completed?
- How was the project completed?
- Results, and what was learned
- Some recommendations

ICT Impact on Productivity/Growth- Why?

Targets from the project

- **Deliver new evidence** on ICT impacts, without adding to statistical burden
- **Build a network** to do this, spreading know-how for data-linking and a system that can deliver results quickly in future
- **Analytical capability** to compare results reliably across countries – essential to understand policy interactions
- **Integrate ICT analysis** alongside other complementary investments (skills, R&D / innovation, organisation)
- **Better understanding for policy** if we can link macro effects to micro causes, to help show which policy levers matter most – but we can only do this by building up from national datasets, because of micro data confidentiality

ICT Impact on Productivity/Growth- Why?

ICT questions EU KLEMS has not answered

- Why is contribution from IT capital lower in EU
  Or… Why is ICT investment lower
- Why is growth in high-tech so much lower
  Or… Why is high-tech sector small, especially in fast growing parts
- Why is unexplained growth so high? Why is TFP growth so much lower in EU
  Or… Why is TFP growth especially low in ICT intensive sectors
- What, if anything, is the role of policy
  Or… If policy affects firms and market interactions, what can industry data tell us about policy

ICT Impact on Productivity/Growth- How?

- Phase 1 - April 2006
- Funded by Eurostat
- Linking data sources "*To identify how ICT adoption affects business behaviour and performance*"
- Project focus shift:

  from Firm level analysis at national level

  ↓

  to Cross-country industry level analysis

Phase 2 – May 2007

Phase 1	Phase 2
U.K - Lead	Germany
Italy	Czech Republic
Denmark	Ireland
Sweden	Norway
Netherlands	
Finland	
Austria	
France	
Slovenia	

ICT Impact on Productivity/Growth- How?

Process of development

- Start from **national microdata analyses** on different aspects of ICT impact (e-commerce, connectivity, e-business links, investment)
- Identify **common key variables** influencing productivity and growth across national studies, and available in most countries
- Identify 'lead countries' able to do **additional analysis** on firm level data for complementary inputs (skills, organisation etc)
- **Compile metadata** to ensure description of data sources on comparable basis across countries, and enable comparable microdata analyses
- **Structure metadata** to compile data at firm level, and indicators at industry / country level, to permit international analysis
- **Combine with other data** (mainly National Accounts (KLEMS), market dynamics from production survey, labour market) to broaden analysis

ICT Impact on Productivity/Growth- How?

ICT metrics used

Variables for most countries	'Lead NSI' variables
Firm uses computers % workers using computers Firm uses internet % of workers with access to internet Firm has website Firm orders via internet (or EDI etc) % of orders (or value) Firm sells via internet (or EDI etc) % of sales (or value) Firm has intranet % of workers with access to intranet Firm has fast internet access % of workers with access to fast internet access	Use of electronic business processes Mobility of access to technology Mobility of workers accessing technology IT investment (or expenditure) at firm level

ICT Impact on Productivity/Growth- How?

Contextual variables / complements to IT

Variables for most countries	'Lead NSI' Variables
Firm size Firm age Employment Payroll Capital Stock Ownership (local or international) Outsource ratios (measured as purchases / sales or similar) Measures of labour 'quality' (measured in terms of pay per person) Industry characteristics (growth, entry / exit, firm share turbulence)	Multinational organisation of firms (from FDI and ownership data) Employee skills (from linked employer – employee datasets) Changes in organisation (from some local surveys, or CIS) Measures of innovation (from CIS)

ICT Impact on Productivity/Growth- How?

Measures of Impact

Levels	Growth rates
Productivity measured as - Gross sales / employee (vs industry) - V.A. / employee (vs industry) Productivity measured in terms of Multi-Factor Productivity (for countries which have firm level data on investment, IT investment, labour and other inputs)	Productivity change measured as - Gross sales / employee (vs industry) - V.A. / employee (vs industry) Growth rates measured for: - Gross sales (deflated by industry PPI) - Market share of IT using firms in industry - Value added (double deflated where possible) - Employment, or share of employment in industry

ICT Impact on Productivity/Growth-Results

Firm level results show different models by industry / country

- Variation in services
  - Some country / industry combinations show negative correlations
  - Positive productivity effects tend to be strongest in countries with highest usage indicators
- Consistent results in manufacturing
  - Broadly similar across EU countries, positive effects on productivity associated with ICT use
  - Some variation in coefficients, but all directionally similar
- IT links to complementary investments
  - ICT impact often dependent on other factors / complements / co-investments

ICT Impact on Productivity/Growth-Results

Industry level results show different impacts by industry / country

- ICT matters across 30 industries x 13 countries
  - Range of metrics show up with links to productivity
- Effects bigger in ‘more networked’ countries
  - UK is in the ‘lead’ group with Scandinavia and France, on ICT impacts, as well as ability to measure it
- Manufacturing consistent pattern
  - More dependent on ICT investment than on ‘linked people’

ICT Impact on Productivity/Growth-Results

Evidence from firm level analysis in lead NSIs

- IT investment and high speed internet deployment
  - broadband is a good indicator – or predictor - of firm level purchased investment (data available for NL and UK)
  - the % broadband using workers have a significant separate effect on productivity in many countries, over and above the effects of ICT investment
  - 'joining up workers' has the biggest effect in differentiated services, where much of the investment is in systems and people

ICT Impact on Productivity/Growth- Results

Evidence from firm level analysis in lead NSIs

- On Innovation
  - evidence that connected workers are more likely to innovate
  - .. from UK that firms which get innovative ideas from third parties are more likely to invest in broadband connections
  - .. from NL / SE that ICT using firms are more likely to produce new products / services, given other inputs, with indirect productivity effects
  - .. from NL that ICT use metrics have similar impact to process innovation
- On ICT and skills
  - higher skills levels increase returns from ICT investment, or from ICT use, whether we use direct measures of skills, or wage measures

ICT Impact on Productivity/Growth-Results

Evidence from firm level analysis in lead NSIs

- On organisation
  - confirmation that some business process links can be associated with significant, positive, productivity effects, in some countries
  - some of the organisation / maturity variables can be expressed in terms of a composite index
- On flexibility / specialisation
  - Finnish evidence that flexibility associated with mobile access to IT has significant productivity benefits
  - Finnish evidence that outsourcing of IT services is associated with worthwhile labour productivity advantages

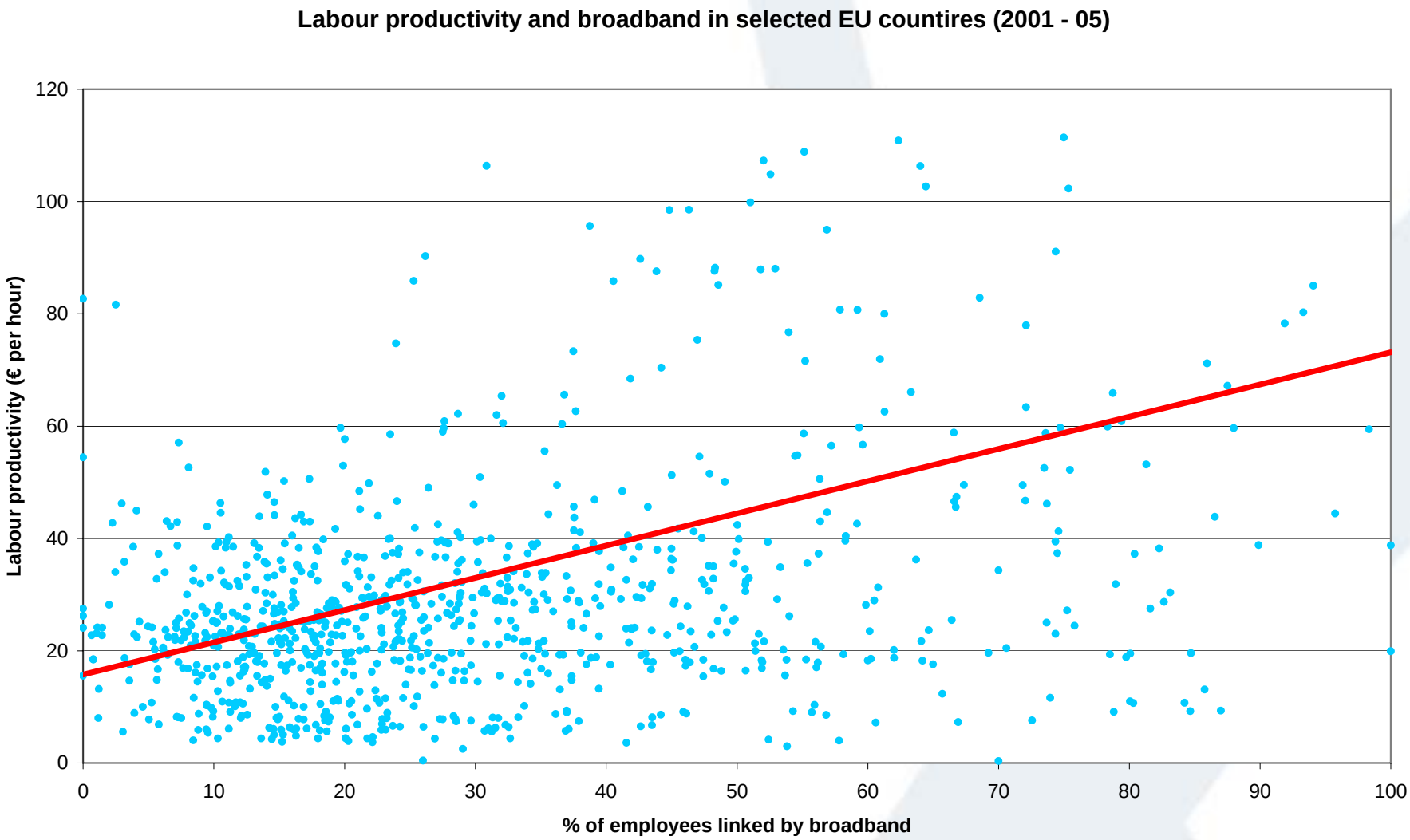
ICT Impact on Productivity/Growth-Results

Evidence from industry / country analysis

- On ICT use
  - Evidence that broadband connected employees is a strong productivity indicator across all 13 contributing countries, over the period 2003-2005
  - Seems to be significant across all industries, even though firm level effects are uneven
  - The ‘extra’ probably due to substitution effects

- On ICT use as driver of competition
  - Cross – EU evidence that higher ICT use is associated with more dynamic competition – measured through share change
  - Consistent with US conclusion by Brynjolfson et al, that ICT ‘enterprise architecture’ enables firms to replicate successful business models

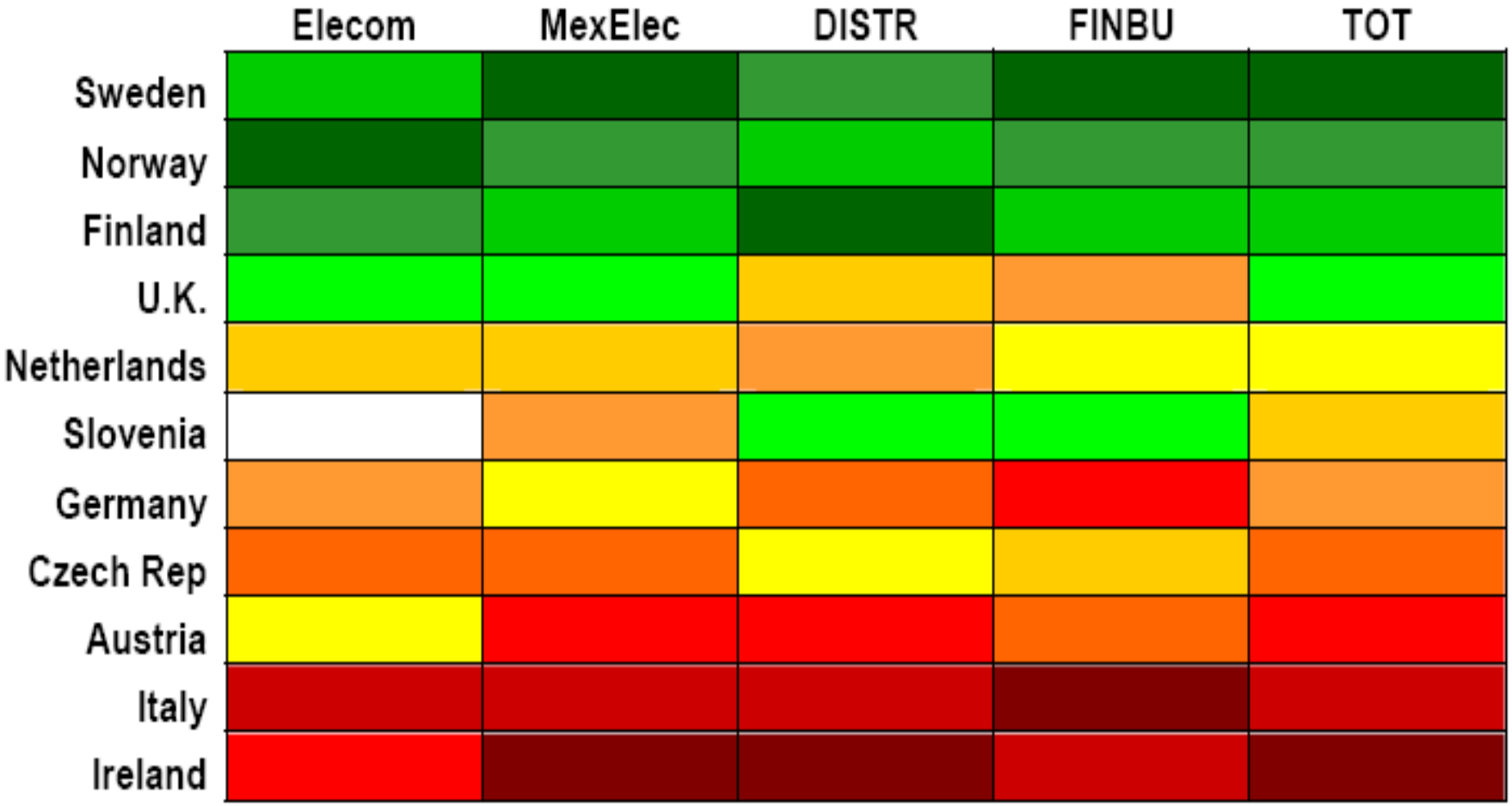
ICT Impact on Productivity/Growth-Results



ICT Impact on Productivity/Growth-Results

New indicators => new perspectives

2004: Colour coded indicator for % broadband enabled employees; green highest, red lowest



ICT Impact on Productivity/Growth- Results

Important to note from an Irish perspective:

Percentage of enterprises with a broadband connection, 2004 - 2008

	Unit	2004	2005	2006	2007	2008
European Union (EU27)	**%**	**46**	**62**	**73**	**77**	**81**
Ireland	**%**	**32**	**48**	**61**	**68**	**83**
Finland	%	71	81	89	91	92
United Kingdom	%	50	65	77	78	87
Ireland as % of EU27 rate	**%**	**69.6**	**77.4**	**83.6**	**88.3**	**102.5**
Finland as % of EU27 rate	%	154.3	130.6	121.9	118.2	113.6
United Kingdom as % of EU27 rate	%	108.7	104.8	105.5	101.3	107.4

Source: CSO/Eurostat.

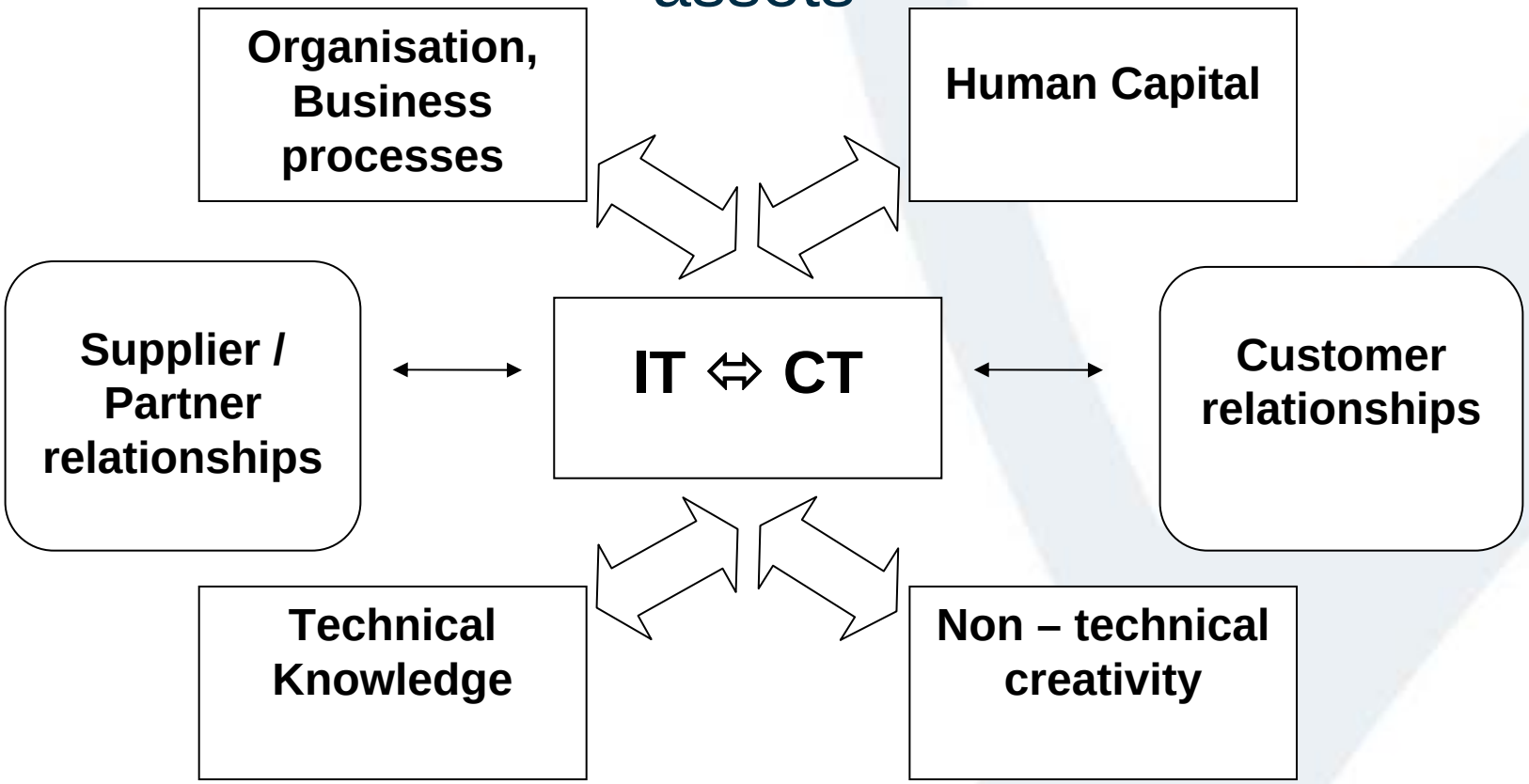
ICT Impact on Productivity/Growth- Recommendations

Interpret ICT with complementary factors

- Intangibles framework
  - Software
  - Technical R&D
  - Non-technical innovation spending
  - Workplace training
  - ‘Organisational’ investment
  - Reputation
  - Done at macro level in US / UK – can we dig down to Micro

ICT Impact on Productivity/Growth- Recommendations

ICT benchmarking should reflect interaction with other assets



ICT Impact on Productivity/Growth-Future?

Where next?

- Eurostat indicating that the exercise will be repeated in the future and extended to other Member States

2. ICT Enabled Innovation (OECD)

Agenda

- Background to the project?
- Current state of play?

ICT Enabled Innovation- Background

Targets from the project

- Assess the effects of ICT as an enabler of innovation
- Use existing microdata from the ICT Survey of Enterprises and the CIS datasets to build results
- OECD to build and coordinate the network to do this
- Consider and test various hypotheses about the usage of ICT on different aspects of innovation

ICT Enabled Innovation- State of play

Plan for project

- Agreed that participating countries will look to link several waves of ICT Enterprise survey to one or more waves of the CIS survey
- Currently engaged in work to determine the ICT indicators and the Innovation indicators which the project will use
- Current timeline envisages final results by August 2009 with preliminary report for OECD Innovation Strategy for October 2009