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Statistical indicators of user innovation in Canadian manufacturing, 2007

**Presented at the workshop
“Sharing Best Practices in R&D Statistics”
Lisbon, Portugal**

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Presentation outline

- Approach
- Survey questions on user innovation
- Measurement issues and lessons learned
- Analysis
- Survey of Innovation and Business Strategy 2009



Survey of Advanced Technology 2007

- Target population
 - manufacturing and logging (NAICS 31-33, 1133) statistical establishments (plants)
 - at least 20 employees and at least \$250,000 in revenues
- Manufacturing
 - population: 16,590
 - sample: 9,441
 - response rate: 72.5%
- 91.5% of manufacturing plants use at least one advanced technology
 - **74.0% of these plants use at least five**

The image shows a sample of the 'Survey of Advanced Technology - 2007' form. At the top, it includes the Statistics Canada logo and the title 'Survey of Advanced Technology - 2007'. Below the title, there is a section for 'Contact as required' with fields for 'Company name', 'Establishment name', 'CIC', 'Address', 'City', 'Province/Territory', and 'Postal code'. The form also contains an 'INTRODUCTION' section with text about the survey's purpose, authority, and confidentiality. At the bottom, there is a 'Survey Contact' section with fields for 'Name', 'Title', 'Telephone number', and 'E-mail'. The form is marked as 'Confidential when completed'.



How plants acquire or integrate advanced technologies

- By purchasing off-the-shelf advanced technology
- By leasing off-the-shelf advanced technology
- By licensing advanced technology
- By customizing or significantly modifying existing advanced technology
- By developing new advanced technologies (either alone or in conjunction with others)
- Through merger or acquisition of another firm with advanced technologies

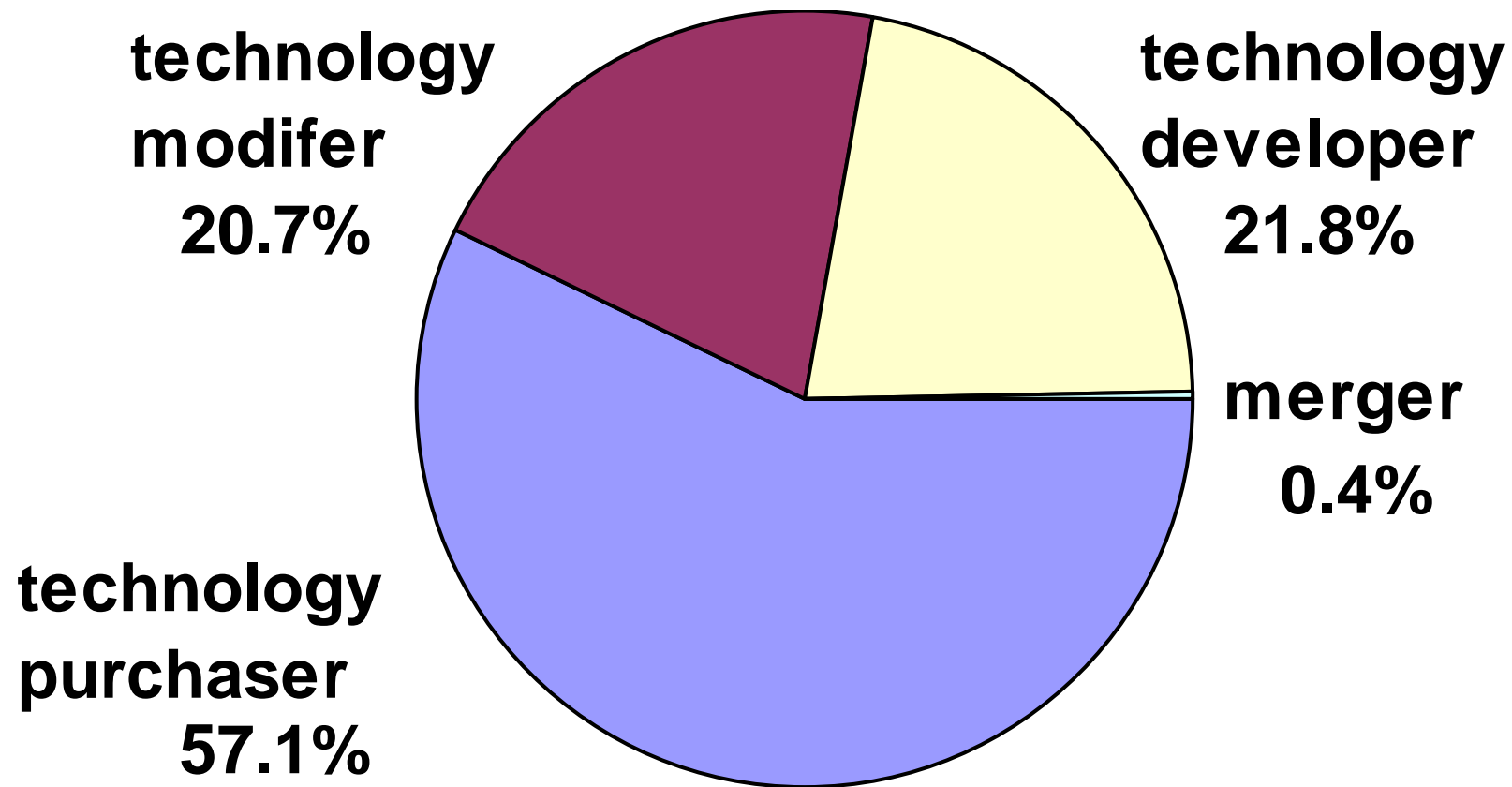


Analytic approach

- Technology adoption categorized by highest level of complexity of method used (Arundel and Sonntag, 1999)
 - **Technology purchaser:** Either purchase off-the-shelf, lease off-the shelf, or license new technologies
 - **Technology modifier:** Customize or significantly modify existing technologies
 - **Technology developer:** Develop new technologies (either alone or in conjunction with others)



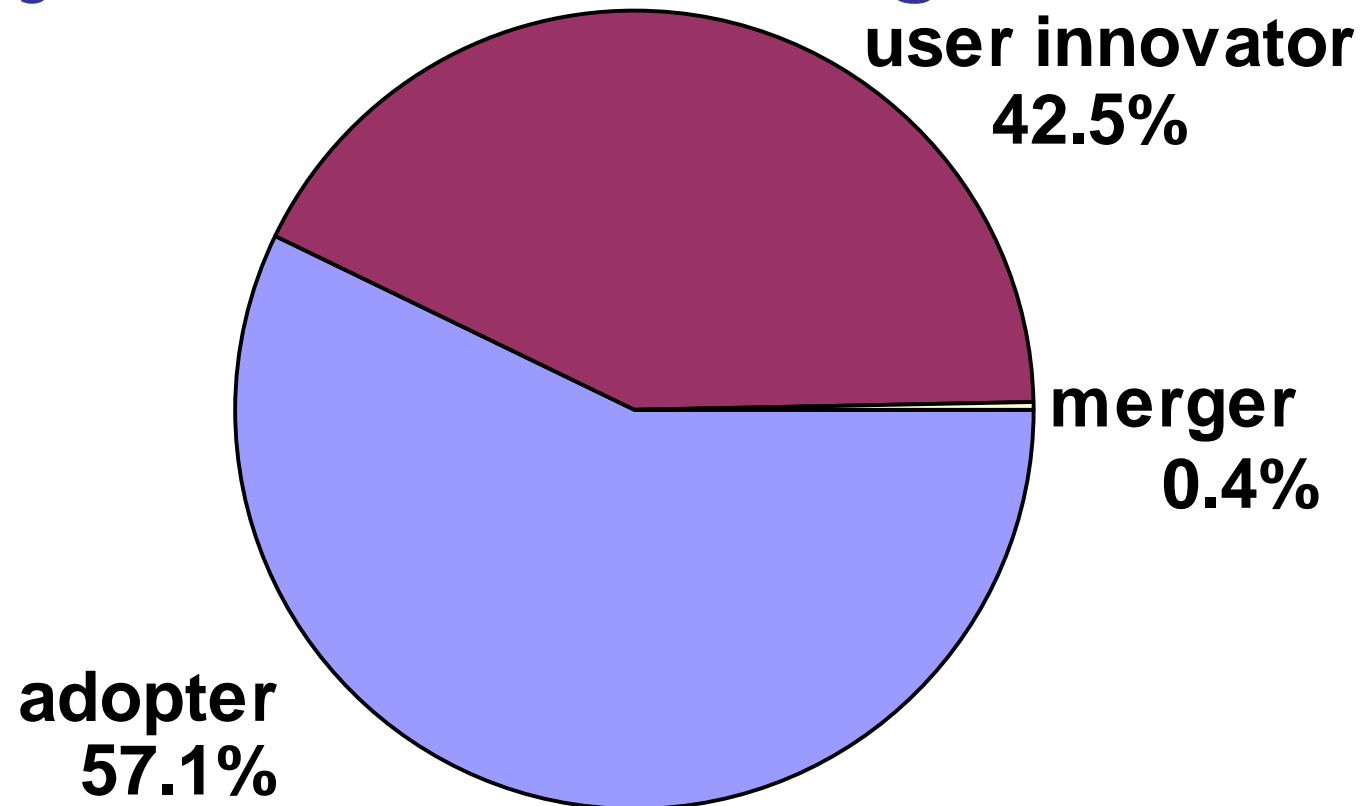
Methods of technology acquisition



Source: Statistics Canada, Survey of Advanced Technology 2007



User innovation is a common activity in manufacturing industries



Source: Statistics Canada, Survey of Advanced Technology 2007



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Follow-up to the Survey of Advanced Technology 2007

Technology modifiers

Technology developers

Science Innovation and Economic Information Division
Follow-up to the Survey of Advanced Technology 2007
Please complete and return this form by March 31st, 2008

Confidential when completed
Si vous préférez recevoir ce questionnaire en français, veuillez appeler au 1-800-491-4640

Please correct any mistakes in name or address

Company name
Establishment name
CDS
Address
City
Province/Territory Postal code

Survey Objective
The objective of this survey is to gain insight into business units that modify technologies. Your business unit has been identified as one that modifies technologies based on your responses to the 2007 Survey of Advanced Technology.

Definitions
In this questionnaire we refer to both "your business unit" and "firm". By "your business unit" we refer to your establishment or local operations as described on the questionnaire label. By "firm" we refer to all related business units and operations in Canada and in other countries that make up the firm.

Coverage
Please complete this questionnaire for your business unit only as described on the questionnaire label, not your entire firm.

Confidentiality
Statistics Canada is prohibited by law from publishing any statistics which would divulge information obtained from this survey that relates to any identifiable business or institution.

Survey Contact
Please indicate the name of the person completing this questionnaire so we know who to contact should we have questions about this report.

Name of person completing questionnaire 0001	Title 0000
Telephone number 0000 () - - - - -	E-mail 0000

Assistance: If you have any questions regarding this survey or you need help to complete the questionnaire, please call 1-866-901-4640 or e-mail: statinfo@statcan.ca. To assist us in responding to your questions, please reference the number beginning with the letter "Q" on the questionnaire label.

5-0900-03-1: 2008-03-12 STATCAN 460-75147



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Science Innovation and Economic Information Division
Follow-up to the Survey of Advanced Technology 2007
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Please correct any mistakes in name or address

Company name
Establishment name
CDS
Address
City
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Survey Objective
The objective of this survey is to gain insight into business units that develop new technologies. Your business unit has been identified as one that develops new technologies based on your responses to the 2007 Survey of Advanced Technology.

Definitions
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5-0900-03-1: 2008-03-12 STATCAN 460-75147



Canada

915 mailed questionnaires

618 responses

72.1% response rate

869 mailed questionnaires

601 responses

73.9% response rate



Survey questions on user innovation

- Frequency (continuous or occasional)
- Part of formal or informal program of technology adoption
- How funded
- Budget used to fund
- Knowledge of other firms with similar user innovations
- Cooperation with other firms or institutions for user innovation
- Who cooperated with



Survey questions on user innovation

- Sharing
- How share
- Reasons why chose to share
- Use of intellectual property protection methods
- IP protection methods used



Survey questions on user innovation

- Knowledge of adoption by other firms
 - Manufacturers
 - Users
- Cost (most recent user innovation)
 - Labour
 - Machinery, equipment, and materials
 - Elapsed time to complete



Measurement issues and lessons learned: Cognitive questionnaire testing

- **Formulation of simple question to measure incidence of user innovation problematic and unresolved**
- **Difficulties with concept of technology modification, especially in case of design software remains unresolved**
- **Capturing “cost” of user innovation**
 - Diverse projects make it difficult to provide one annual figure
 - Asked about most recent user innovation
 - Cost figures not known by CEO or not willing to provide
 - Estimated total cost of labour (\$)
 - Estimated cost of machinery, equipment and materials (\$)
 - Estimated elapse time to complete (options in days/months)



Measurement issues and lessons learned: Data collection

- Respondents are able and willing to complete questions on user innovation activities
 - **73% overall response rate (returned questionnaires)**
 - **Individual question non-response highest for quantitative questions**
 - 87.4% response rate for average cost of labour
- Respondent feedback: 1.5% of technology modifiers sought clarification on concept of technology modification



Analysis at Statistics Canada

- Measuring user innovation in Canadian manufacturing 2007
 - Susan Schaan and Marc Uhrbach (2009) catalogue number 88F000620090003
- Spill-overs from user innovation in Canadian manufacturing
 - Anthony Arundel, Fred Gault, Eric von Hippel and Susan Schaan



Survey of Innovation and Business Strategy 2009

- Target population: 69,857 statistical enterprises
- Sample: 6,233 statistical enterprises
 - Agriculture, forestry, fishing and hunting
 - Mining, quarrying, and oil and gas extraction
 - Construction
 - Manufacturing
 - Wholesale trade
 - Retail trade
 - Transportation and warehousing
 - Information and cultural industries
 - Finance and insurance
 - Real estate and rental and leasing
 - Professional, scientific, and technical services
 - Management of companies and enterprises
 - Administrative and support, waste management and remediation services

Business Special Surveys and Technology Statistics Division (BSS TSD)
**Survey of Innovation and Business Strategy,
2009**

CONFIDENTIAL once completed
Si vous préférez ce questionnaire
en français veuillez nous appeler au
1-800-461-1082.

Correct as required

Company Name C0001
Establishment Name C0002
First Name C0003
Last Name C0005
Address C0004
City C0006
Province/Territory C0008 Postal Code C0007

Information for respondents

Survey Purpose
Statistics Canada is undertaking this survey to provide useful statistical information on strategic decisions, innovation activities and operational tactics used by Canadian enterprises. The survey also collects information on enterprise involvement in global value chains.

The information compiled by this survey will be used by the Canadian government to better understand the impact of strategy and innovation decisions and the operational adaptations on the Canadian economy including productivity and competitiveness. This enables the government to develop policies to support industry in their efforts to improve productivity and competitiveness.

Your response is required by law
The Statistics Act requires businesses and other organizations that receive this questionnaire to answer the questions and return the report to Statistics Canada.

Appreciation
Canada owes the success of its statistical system to a long-standing co-operation involving Statistics Canada, the citizens of Canada, its businesses, governments and other institutions. Accurate and timely statistical information could not be produced without their continued co-operation and goodwill.

Planned record linkage
To increase the analytical potential of this survey Statistics Canada plans to combine the data obtained from this survey with data from other Statistics Canada surveys or from administrative sources. Statistics Canada may combine this information collected through this survey with information collected from publicly available sources, including websites.

Confidentiality
Statistics Canada is prohibited by law from publishing any statistics which would divulge information obtained from this survey that relates to any identifiable organisation without the previous consent of that organisation or as permitted by the Statistics Act. The data provided by this questionnaire will be treated in strict confidence. The confidentiality provisions of the Statistics Act are not affected by either the Access to Information Act or any other legislation.

Who should complete this questionnaire?
The entrepreneur, CEO or a senior manager with thorough knowledge of the enterprise and its strategic vision.

Reporting
Please report amounts in Canadian currency for reference year 2009.

Assistance
If you have any questions or require assistance, please contact us:
Telephone: 1-800-461-1082
Fax: 1-800-737-3181
E-mail: LBTSurgeon@statcan.gc.ca

Contact Person

First name C0012 Telephone number C0017
Last name C0004 Extension C0027
Position title C0014 Fax number C0018
Web site address C0020 E-mail address C0019

Statistics Canada Statistique Canada 5-8805-9421 2009-10-07 270546-465-75402 Canada



Advanced technology use

Technology is broadly defined to include the technical means and know-how required for the production of goods or services. It takes the form of equipment, materials, processes, blue prints and knowledge.

Advanced technologies are new technologies (equipment or software) that perform a new function or improve some function significantly better than commonly used technologies in the industry or by your competitors.

44. In 2009, did your enterprise use any of the following types of advanced technologies (equipment or software)?

	Yes	No	
a. Advanced computerized design and engineering	1 <input type="radio"/>	3 <input type="radio"/>	0440010
b. Advanced computerized processing, fabrication, and assembly technologies	1 <input type="radio"/>	3 <input type="radio"/>	0440020
c. Advanced computerized inspection technologies	1 <input type="radio"/>	3 <input type="radio"/>	0440030
d. Advanced communication technologies	1 <input type="radio"/>	3 <input type="radio"/>	0440040
e. Advanced automated material handling technologies	1 <input type="radio"/>	3 <input type="radio"/>	0440050
f. Advanced information integration and control technologies	1 <input type="radio"/>	3 <input type="radio"/>	0440060
g. Advanced biotechnologies/bioproductions	1 <input type="radio"/>	3 <input type="radio"/>	0440070
h. Advanced nanotechnologies	1 <input type="radio"/>	3 <input type="radio"/>	0440080
i. Advanced green technologies	1 <input type="radio"/>	3 <input type="radio"/>	0440090
j. Other type of advanced technology, please specify:	1 <input type="radio"/>	3 <input type="radio"/>	0440100

0441106



45. How did your enterprise acquire or integrate the advanced technologies (equipment or software) listed in previous question?

Check (✓) all that apply

- | | |
|---|-------------------------------|
| a. By purchasing off-the-shelf advanced technology (equipment or software) | <input type="radio"/> 0450001 |
| b. By leasing off-the-shelf advanced technology (equipment or software) | <input type="radio"/> 0450002 |
| c. By licensing advanced technology | <input type="radio"/> 0450003 |
| d. By customizing or significantly modifying existing advanced technology | <input type="radio"/> 0450004 |
| e. By developing new advanced technologies either alone or in conjunction with others | <input type="radio"/> 0450005 |
| f. Through merger or acquisition of another enterprise with advanced technologies | <input type="radio"/> 0450006 |



Thank you
Obrigada

susan.schaan@statcan.gc.ca