Multi-mode survey response process for a complex economic survey

Lessons Learned from the Evolution of the Business R&D and Innovation Survey's User Interface

"We have an app for that"

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Economic Statistics

Overview

- Business R&D and Innovation Survey (BRDIS) Background

- BRDIS – A challenging survey to complete

- What we learned from respondents

- What we did to facilitate the response process

- BRDIS Reporting Trends

- Future Considerations

Background on BRDIS

- Primary federal source of information on the R&D activity of businesses in the U.S.

- Conducted under a joint partnership agreement between the U.S. Census Bureau and the National Science Foundation (NSF)

- Fielded as a full scale pilot in 2008
  - Replaced the Survey of Industrial R&D (SIRD)
  - Mailed to ~ 40,000 U.S. based companies
  - Survey collected under Title 13 authority
    - Response is required by law
    - Response is confidential by law

BRDIS Population & Reporting Unit

- Target population: All for-profit companies with U.S. operations that are classified in non-farm industries and have 5 or more U.S. employees

- Reporting unit is the addressed company (not establishment)

  - Companies report data for all foreign and domestic subsidiaries where the company has majority ownership

BRDIS Challenges

- Survey content expanded significantly from the SIRD
  - Data Items increased from 342 in 2007 to 717 in 2008
  - The 2007 RD-1 form was 17 pages – The 2008 BRDI-1 form was 56 pages. The 2007 RD-1A form was 7 pages – The 2008 BRDI-1A was 28 pages
  - Content was expanded into more non-accounting areas (R&D Management and Strategy, Patent information, IP protection questions, Technology Transfer questions, expanded HR detail questions and Innovation questions)
  - Not all content applies to every company

BRDIS Challenges

- R&D is a highly concentrated activity in the U.S.

- Very diverse organizational structures – Varying degrees of data access

- Survey burden for these companies dramatically increased from 2007 to 2008

- **Most respondents must coordinate the response process and/or consolidate data from different divisions or business units**

Lessons Learned

- Data requested located in different places within the companies

- Respondents were scanning the form to create PDF version that could be emailed to colleagues

- Respondents were programming spreadsheets versions that could be emailed to colleagues

    * **Format did not include the relevant instructions that are on the questionnaire**

- Some respondents needed to consolidate the information to compile a company report

"We have an app for that"

- Designed the questionnaire to be a color coded sectional booklet

- Created PDF versions of each questionnaire and made them available on our web site

- Programmed Excel Spreadsheets of each individual section and made them available on our web site

- Programmed a consolidator spreadsheet and made it available on our web site

Internet Reporting

Lessons Learned

- Most respondents prefer to use the web instrument

- Respondents were using paper/excel/PDF formats to gather data within the organization

- Respondents were then entering the data from the various formats into the web instrument

Paper vs. Excel

Excel Error Checking

who work on R&D or who provide direct support to R&D such
ans, clerical staff, and others assigned to R&D groups.
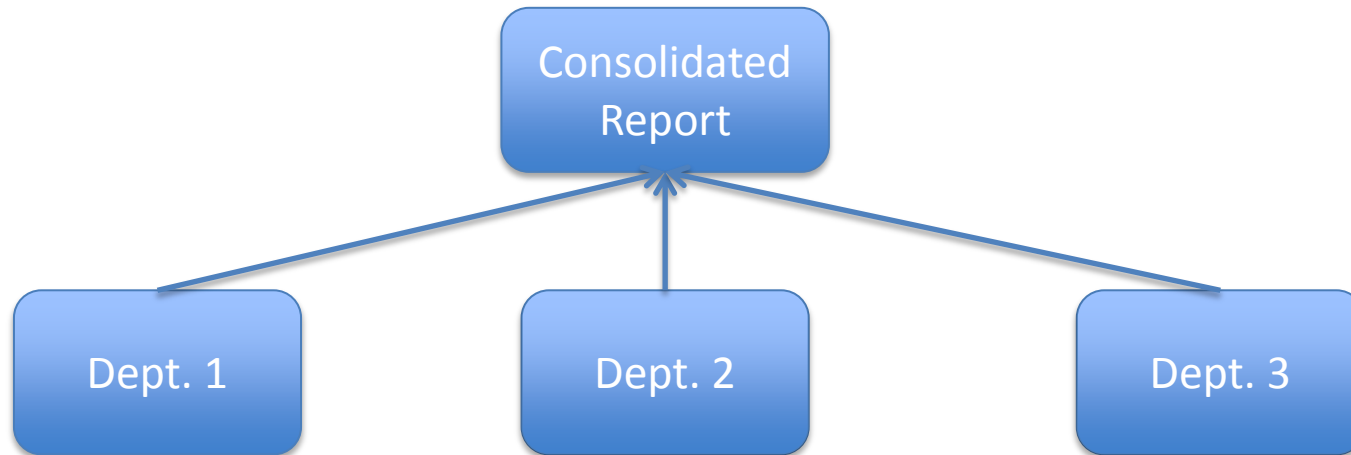
ho provide indirect support to R&D, such as corporate
workers.

(1) Domestic Operations	(2) Foreign Operations	(3) Total Employees
12	23	100

Total line equals Question 5-2

! The sum of column 1 and column 2 does not equal column 3.

Consolidator Tool

Excel Consolidator

This spreadsheet uses a visual basic macro to consolidate data from multiple workbooks. It is designed to be used by companies that have more than one completed section workbook for any survey section. In order for the consolidator to work properly, you must allow macros to run when opening this file. Further instructions are listed in the "FileInput" sheet of this file.

NOTE: This consolidator does not check for errors or illogical values. We suggest you check the resulting consolidated figures carefully to verify that the results are correct.

- ○ Excel Consolidator [XLS] (Last updated April 6, 2011)

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- Programmed an upload capability for the 2009 BRDIS

  ➢ System populates the answers if proper excel format is used

Use of Excel Tools for reporting the 2010 BRDIS

- The 2010 BRDIS sample was ~ 43,000 companies
  - ➢ We mailed ~ 2,600 BRDI-1 forms
- The R&D Expense section was downloaded a total of 2,374 times with 1,402 of those from the BRDI-1 form
  - ➢ Consolidator was downloaded 543 times
- Respondents complemented the spreadsheets during post survey interviews

BRDIS Internet reporting trends

Legend:
- % of all responses (unweighted)
- % of BRDI-1 form responses (unweighted)
- % U.S. R&D reported (weighted)

X-axis: 2007*, 2008, 2009, 2010**
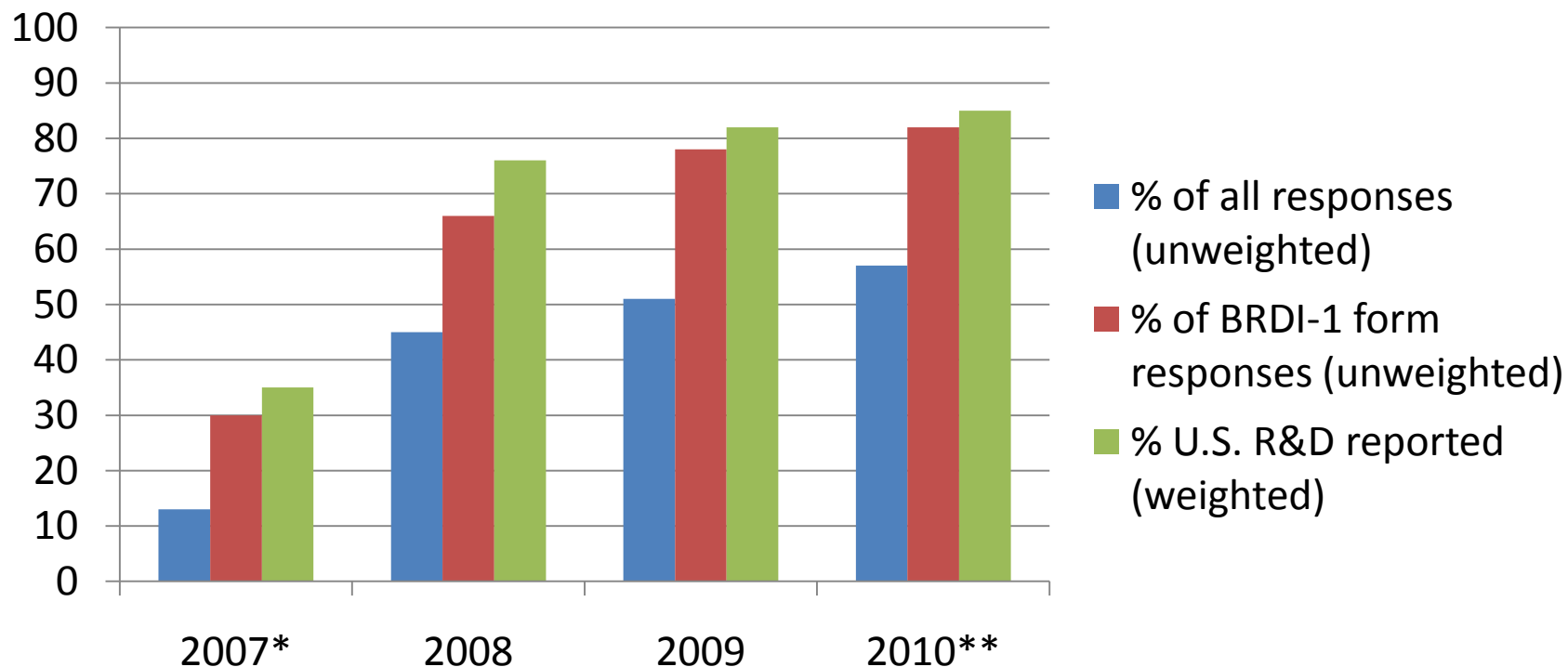
* The 2007 SIRD electronic instrument was not web based
** The 2010 data are preliminary at this point

Web Survey = Fewer Observed Reporting Errors

- Fewer balancing errors from online reports

- Fewer "path-related" errors from online reports (skip patterns are automated)

- Online reports are more "complete" than paper reports (significantly less imputed data from online reports)

Testing the Impact of Web Reporting

- Generalized Ordered Regression Model (Adua and Sharp 2010) (Hough, Keller, Wilkinson, Curcio 2011)

- Dependent variable coded at three levels
  - ➤ Level 1 = no imputation
  - ➤ Level 2 = < 15% of data items imputed
  - ➤ Level 3 = > 15% of data items imputed

- Web reporters were more than 3X more likely to have zero imputations than paper

Future Considerations

- 2011 Long form (BRDI-1) respondents will be directed to report on line. No form in initial mailing.

- Explore ways to integrate more context-based instructions, edits, and guidance into the web survey and electronic tools

  ➢ As noted earlier, not all content applies to all respondents (industry-specific items, foreign-owned companies, govt. contractors, etc.)

Contact Information

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Testing the Impact of Web Reporting Regression Results

N = 1,092,819 (23,782)

	Estimate	Std Error	Prob > ChiSq	Log Odds
Intercept[1]	-6.46	0.0207	<.0001	
Intercept[2]	3.49	0.0070	<.0001	
Web Reporter	1.28	0.0161	<.0001	0.2788
Account Manager Company	1.05	0.2218	<.0001	0.3489
Manufacturing	-0.19	0.0193	<.0001	1.215
Funded R&D	-2.34	0.0285	<.0001	10.405
Outsourced R&D	-0.89	0.0329	<.0001	2.4269
Company reports to the ACES	0.26	0.072	0.0003	0.7708
Public Owned Companies	-0.26	0.1060	0.0141	1.2970
Foreign Owned Companies	-0.65	0.0983	<.0001	1.9070

Use of Excel Tools for reporting the 2010 BRDIS

Total Downloads	All Form Types	BRDI - 1
Section 1	4,010	2,342
Section 2	2,374	1,402
Section 3	1,573	862
Section 4	1,536	843
Section 5	1,550	849
Section 6	1,575	850
Section 7	1,509	803
Consolidator	543	
Total	**14,670**	**7,951**