

Arthur Andersen LLP

33 West Monroe Street
Chicago IL 60603-5385

March 11, 1996

The Government/University/Industry Research Roundtable

Ladies and Gentlemen:

The following report provides the results of our expanded analysis of the cost of research among selected industry, university, and federal laboratory participants. We appreciate the opportunity to work with the GUIRR in connection with this important issue. We thank the participants for their time and information provided to us, without which this report would not be possible.

Very truly yours,

ARTHUR ANDERSEN LLP

James H. Roth

Attachment



REPORT OF PROJECT RESULTS

To the Government-University-Industry Research Roundtable (GUIRR):

In November 1994, Arthur Andersen LLP presented the results of a review of the cost of research among selected industry and university participants. At that time, the GUIRR indicated that although the content of the report was informative, the data would be even more useful if the number of participants were increased. During the past year, we have increased the number of participants from thirteen to thirty-three.

The project background and methodology as well as the accompanying notes and attachments are integral parts of this report and should be read in conjunction with the financial information.

In accordance with our agreement, individual participant financial data has been kept confidential. Arthur Andersen has not audited the data provided; rather, reliance was placed on participants for the accuracy and validity of the data. The purpose of the study is to provide insight into the cost of research for selected research participants; it is not, nor is it intended to be, a statistically valid analysis of all research entities.

We spent considerable time working with the individual participants to understand the nature of the submitted cost information. Reviews for comparability purposes are described in detail in Attachment A "Work Steps Involved in Data Analysis". We are reasonably confident that the procedures adopted are sufficient to ensure that potential comparability issues will not materially affect the results of the study.

PROJECT BACKGROUND

In 1992, the Government-University-Industry Research Roundtable (GUIRR) initiated a Cost of Research Study to improve the understanding of research costs incurred in academic and industrial sectors. The objective of the project was to compare the cost of research at certain universities and corporate research laboratories in order to identify the similarities and differences in the elements of cost incurred in conducting research. In 1980, industry spending for university R&D represented only 3.9 percent. By contrast, in 1992, industry provided 7.1 percent (\$1.35 billion) of all R&D expenditures by universities. As industry spending continued to provide an increasing share of the university R&D funding, the GUIRR felt that an improved understanding of the costs of research would improve working relationships between universities and their partners and supporters in industry and government.



Government-University-Industry Research Roundtable Cost of Research Study - Report of Project Results March 18, 1996

Of equal importance was the notion that an improved understanding of the cost incurred in conducting research would also help to address perceptions that have recently developed concerning the allegedly excessive cost of research support at large research universities. Allegations of excessive indirect costs charged to federally sponsored programs and the ensuing governmental actions aimed at reducing indirect costs charged to the federal government have created a contentious atmosphere among research universities and their federal and corporate sponsors.

INITIAL PROJECT SCOPE - PHASE I

The project initiated in 1992 focused on obtaining research cost information from universities. During approximately an eighteen month period, we worked with seven private and state-supported universities, including Indiana University, Massachusetts Institute of Technology, University of California at Los Angeles, University of Pennsylvania, University of Southern California, Vanderbilt University and Washington University. In conjunction with the seven institutions, we developed a template to identify and then classify the various elements of cost attributable to research in universities. Each of the seven universities completed the template, accounting for the total cost of research at their respective institutions. For purposes of this analysis, we ignored the government-imposed administrative cost ceilings or "caps" in order to more accurately determine the total cost of research, irrespective of regulatory limitations.

After the university information was completed, we focused on obtaining comparable research cost information from industrial research organizations. The template was provided to the industrial participants to obtain comparable cost information. Six industrial organizations provided information, including the research labs at AT&T, Coming, General Electric, General Motors, Hewlett-Packard and Philips Electronics.

The results of Phase I were reported in November 1994.



Government-University-Industry Research Roundtable Cost of Research Study - Report of Project Results March 18, 1996

PROJECT EXPANSION - PHASE II

In response to the GUIRR's request to enlist additional participants, the project was expanded in 1995. Seven additional industrial organizations were added in 1995:

Abbott Laboratories
Bristol-Myers Squibb, Inc.
G.D. Searle and Company
Genentech, Inc.
Monsanto Corporate Research
The Procter and Gamble Company
The Upjohn Company

In order to broaden the project's exposure, another sector was added to the study: federal laboratories. Thirteen federal laboratories responded to our request for information:

Argonne Laboratories
Pacific Northwest National Laboratory
Brookhaven National Laboratory
John A. Volpe National Transportation Systems Center
Lawrence Berkeley National Laboratory
Lawrence Livermore National Laboratory
Los Alamos National Laboratory
National Institute of Standards and Technology
National Institutes of Health
Oak Ridge National Laboratory
Sandia National Laboratories
SRI International * (See Note A)
U.S. Army Research Laboratory

The financial data provided for Phase II is for fiscal years ending in 1994 (certain industry participants provided 1993 data, but verified that it was still an accurate reflection of the total cost of research).

Note A: SRI International is a not-for-profit organization.



Government-University-Industry Research Roundtable Cost of Research Study - Report of Project Results March 18, 1996

PHASE II RESULTS

Summary: All Sectors

A summary of the elements of the total cost of research, by sector, follows. The data is presented in two formats: one to distinguish between the ratio of costs incurred at the research lab versus those incurred for facilities and central services; and one to distinguish between the ratio of costs classified as direct costs versus those classified as indirect costs.

	Federal	University	Industry
	<u>Average</u>	<u>Average</u>	<u>Average</u>
Cost Incurred at the Research Lab: Directly Charged Indirect Support Cost Subtotal, Incurred at Research Lab	67%	69%	64%
	7%	<u>8%</u>	<u>4%</u>
	74%	77%	68%
Facilities Central Services/Home Office	13%	18%	21%
	13%		11%
Total Cost of Research	100%	<u>100%</u>	100%

The nature of costs incurred for research activities in federal laboratories, universities and industry is similar. For federal laboratories, universities and industry, costs incurred at the research facility or academic department level account for a majority of the total research cost (approximately 68% to 77%). Facilities costs comprise 13% to 21% of the total cost of research. The third component of the cost of research is central services or home office costs with a range of 5% to 13%. Attachment D provides detail results by sector with accompanying notes.

Viewed more simply, the total costs of research can be categorized as direct and indirect costs. From this perspective, the comparison of the participants is as follows:



Government-University-Industry Research Roundtable Cost of Research Study - Report of Project Results March 18, 1996

	Federal <u>Average</u>	University <u>Average</u>	Industry <u>Average</u>
Total Cost of Research Classified as Direct	67%	69%	64%
Total Cost of Research Classified as Indirect	_33%	31%	36%
Total Cost of Research	100%	100%	100%

Differences in operations and organizations result in variations in the assignment of costs between direct and indirect accounts. The strong comparability of research costs classified as direct versus those classified as indirect in all environments is important to note given the different organizational structures found in federal laboratories, universities, and industry.

CLOSING

As the amount of money flowing from industry to universities continues to increase, and federal budget constraints limit the amount of money available to all sectors, it has become even more important for the providers and users of research funds to have an understanding of the financial structure of their common interests. This analysis does not address all of the issues currently facing federally sponsored and industrial research. It is our intent, however, to assist in the process of providing industry, academia, and the federal government with a better understanding of the cost of research.

Our analysis also helps to address perceptions that have developed in recent years concerning the allegedly excessive cost of research support at large research universities. The data received from organizations participating in this study does not support allegations of excessive research support costs. Comparing the data provided by study participants in industry, universities, and federal laboratories, no one sector is distinguished as being excessive in terms of expenditures for research support costs.

We recognize that the conduct of research is of critical importance to the country, and that policy changes impacting research funding will require analyses far more in depth than this



Government-University-Industry Research Roundtable Cost of Research Study - Report of Project Results March 18, 1996

study. If this project provides incentive or direction towards future studies about research funding, we will have considered the study a success.

We appreciate the opportunity to work with the GUIRR on this analysis and look forward to future participation on this important issue.



ATTACHMENT A

Government-University-Industry Research Roundtable Cost of Research Study - Report of Project Results March 18, 1996

WORK STEPS INVOLVED IN DATA ANALYSIS

We undertook a two step process to maximize the extent to which the data provided was comparable both between and within categories. First, we reviewed all data submissions to ensure the data was complete and correctly classified within the cost categories set out in the template. We contacted all participants to obtain any information necessary to complete or clarify the submissions. During this process, we had the opportunity, through our discussions with the respective participants, to evaluate the extent to which the information provided was comparable to that of other participants. Based on discussions with the participants and the availability of revised information, adjustments were made to enhance comparability.

Second, we calculated the applicable percentage for each major category of cost for each participant. The calculations included average cost percentages for each cost category for each type of participant (federal, academic and industry), and the range of cost percentages for each category. This information was provided to each participant in order to give them the opportunity to review, comment and confirm their data submissions. During this process, a number of participants contacted us with clarifications and revisions. As an added step, we contacted those participants at the high and low end of the cost categories to evaluate whether comparability issues may have caused their results to be on the far end of the spectrum of results.

In addition to calculating the averages for each sector, we also calculated the median. While median direct cost percentages were lower than the average direct cost percentages, there was no affect on the ranking of the three sectors.



Government-University-Industry Research Roundtable Cost of Research Study - Report of Project Results March 18, 1996 ATTACHMENT B

DEFINITIONS: ELEMENTS OF THE COST OF RESEARCH

The elements of the cost of research in government, academia and industry were segregated into three categories. Attachment E displays the template used to collect data from all three categories of participants.

1. Research Lab/Academic Department

The costs assigned to this category reflect the direct and indirect costs incurred at the research facility in support of the conduct of research. For universities, this cost category includes the research salaries, fringe benefits, other direct costs, and the related departmental administration costs incurred within the academic department and division in support of the research lab. In academia, a research lab is defined as the research segment of an academic department. For federal and industrial labs, the costs reflect the direct and indirect labor, other direct costs, and the administrative support staff residing at the research facility. In both cases, central service or home office support costs are excluded from this category.

2. Facilities

The costs in this category represent the costs of operating and maintaining research facilities, including facility and equipment depreciation or use allowances.

3. Central Services or Home Office

These costs reflect the general and administrative or home office costs, which are allocable to the research laboratory. Typically these costs include executive administration, legal, accounting, and other centralized activities to the extent that they support research. In addition, the cost of library is included in this section.

The total cost of research for universities includes all costs allowed by the Office of Management and Budget Circular A-21 absent caps. For industry, the total cost of research includes all costs allowed by the Federal Acquisition Regulation. For federal institutions, the total cost of research includes all costs incurred.



Government-University-Industry Research Roundtable Cost of Research Study - Report of Project Results March 18, 1996 ATTACHMENT C

NOTES REGARDING FINANCIAL INFORMATION

- a) There are known differences in the types of research performed by the participants. Certain types of research require greater investments in facilities and equipment.
- b) There are known differences in the sophistication of cost accounting systems and in accounting policies and practices. Certain cost accounting systems, policies and practices allow for a greater degree of direct-charging.
- c) Costs of researchers, facilities, and central services are shared in certain sectors between multiple functions which may result in economies.
- d) Research organizations that receive federal funding generally rely on the applicable regulatory cost principles as a basis for determining the reasonable direct and indirect costs of research. In industry, a government contractor would rely on the Federal Acquisition Regulation (FAR), whereas in academia, the applicable regulation is Office of Management and Budget Circular A-21 (A-21). Although recent modifications to A-21 have limited the recovery of normally allowable administrative costs, for purposes of this analysis, we ignored the administrative cost ceilings or "caps" in order to more accurately determine the total cost of research, irrespective of regulatory limitations.
- e) For purposes of this analysis, profit is not included in industry data. As the study addresses cost, not price, the profit factor is omitted.



ATTACHMENT D

Government-University-Industry Research Roundtable Cost of Research Study - Report of Project Results March 18, 1996

DETAIL RESULTS BY SECTOR

Federal Laboratories	Range	<u>Average</u>
Research Lab ¹	61% - 90%	74%
Facilities ²	2% - 22%	13%
Central Services/		
Home Office ³	5% - 30%	13%
Universities		
Research Lab ¹	<i>7</i> 0% - 81%	77%
Facilities ⁴	14% - 24%	18%
Central Services/		
Home Office ⁵	3% - 7%	5%
Industry		
Research Lab ¹	55 % - 86 %	68%
Facilities*	11% - 34%	21%
Central Services/		
Home Office ⁷	2% - 23%	11%

Notes:

Research Lab costs for a few research laboratories contained significant subcontractor activity. In these cases, the ratio of Research Lab costs to total costs is higher than those that do not have heavy utilization of subcontractors. It follows that central services and facilities costs would be a lower percentage of total costs, since the facilities and central services costs related to those subcontracts are, in large part, incurred at the subcontractor's site.

²Facilities costs at a number of federal research laboratories do not include depreciation expense and do not include interest expense incurred in construction of facilities.

³Central Services/Home Office costs reported by a few federal laboratories were significantly higher than those reported by the majority of laboratories. Based on follow up discussions with these laboratories, we concluded that no adjustments were required.



ATTACHMENT D

Government-University-Industry Research Roundtable Cost of Research Study - Report of Project Results March 18, 1996

4Facilities costs at universities were higher for those universities with newer facilities.

⁵Central Services/Home Office costs as a percentage of total research costs at universities remained in a close range at levels generally below that of other sectors. Certain factors may influence this relatively low level of central costs attributable to the research enterprise such as:

a) central costs within universities are shared across a broad base of activities, including instruction, public service, and, in certain universities, patient care; and b) certain types of central costs may be direct charged to projects at universities and treated as central costs at federal laboratories and industry such as telecommunications and computer services.

Facilities costs for industries fluctuated substantially. This is in part due to certain industries having newer/more expensive facilities than others. Additionally, there were a few industries that had significant library costs (which are included under facilities costs for purposes of presentation of data).

The ratio of Central Services/Home Office costs to total research costs fluctuated in response to fluctuations discussed in Notes 1 and 6 above.



Government-University-Industry Research Roundtable Cost of Research Study - Report of Project Results March 18, 1996 ATTACHMENT E

COST OF RESEARCH STUDY TEMPLATE AND DEFINITIONS

Government-University-Industry Research Roundtable

Cost of Research Study Template

CONFIDENTIAL

Financial Information for One Year Period

Information should be most recent annual operating year for which complete financial information is available. For example, Vanderbilt University's financial year is July 1 through June 30. The financial information displayed on Vanderbilt University's Cost of Research Template is for the financial year ended June 30, 1994.

Forward completed templates to:

James H. Roth, Partner Arthur Andersen & Co., S.C. 33 West Monroe Street Chicago, Illinois 60603

FAX: (312)931-0988

The completion target date is April 30, 1995.

If you have questions regarding the template, please contact Mr. Roth at (312)507-6047.

Government-University-Industry Research Houndtable	•
Total Cost of Research Template	
Government Lab/University/Industry Name:	
Financial Data For Year Ended	
OF LARRIAGE DESIGNED HINTS	
RESEARCH COST OF LABS/ACADEMIC RESEARCH UNITS	

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(i on one	MEFLECT TOTAL AL	LOCATED INDIRECT	,	
	Research	Research		
		Lab/Dept		Percent
	Lab/Dept		<u>Total</u>	of Total
	Direct Cost	Support Cost	- A181	
RESEARCH LAB/ACADEMIC DEPT COST O	F RESEARCH			•
Salary and Fringe Benefits:				
Scientist/Facility/Postdoc	(A1)	(81)		
Staff: Technical/Clerical	(12)	(82)		
Students: Graduate/Undergraduate	(LT)	(83)		
Other	(40)	(84)		
otal Salaries and Fringe Benefits	\$	\$	\$	%
		N/A		
Equipment Purchases on Contracts/Grants	(45)	•		
Other Direct Costs	UG	, <i>(BS)</i>		<u> </u>
THE STATE OF STATE AT THE				
TOTAL COST OF RESEARCH AT THE	•	\$	\$	- %
RESEARCH SITE/FACILITY/UNIT			Service of the servic	
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Operations and Maintenance:	•			
Security				
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Physical Plant				
Maintenance				
Grounds				
Janitorial				
Facilities Planning				
Other			*****	%
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Electrical				
Fossil Fuels				
Water & Sewer				
Other Utilities				
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			(F) \$	• •
Facility/Equipment Depreciation OR Use Alic	THE I I CO			<u> </u>
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General Administration: Finance/Personnel/Business Svcs Legal Costs	S ALLOCATED TO	RESEARCH UNIT/FAC	CILITY:	
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General Comments:

Participating entities are asked to use their most current operating year when completing the template. For example, Vanderbilt University used its fiscal year 1993/94 (July 1, 1993 through June 30, 1994) as this was the most recent year for which complete financial data was available.

Participating entities are asked to provide additional information whenever possible to describe the methodologies used in allocating costs to research.

The overall objective of the template is to identify the TOTAL cost of research and then separate TOTAL cost into various components.

Broken lines on the template ("____") indicate that data is not required, although it is requested that these lines be completed if data is available at this level of detail.

The template was originally designed for use by universities, therefore terminology may not always be consistent with cost categories used by government labs or industry. The notes below provide alternate terminology and narrative descriptions to facilitate completion of the template.

Notes:

Research Lab/Dept Direct Cost (A)

The costs in this category include those that are directly related to the conduct of sponsored research. For universities, this includes costs directly charged to internally- and externally-sponsored contracts and grants, including any cost sharing amounts.

A comparable term in industry is APPLIED costs or costs incurred "in the laboratory" that are directly identifiable to research. Further, industry may include the UNAPPLIED COST OF APPLIED personnel in this category or in the column described in Note (B) below. UNAPPLIED COST OF APPLIED personnel include items such as vacation, personal leave, education and library time of personnel "in the laboratory. See also Note (B) below.

Scientist/Faculty/Postdoc (AI)

This category includes the salary and associated fringe benefit cost of scientist/researcher direct programmatic effort on research contracts and grants (includes amounts funded by the grant or contract plus amounts funded through cost sharing arrangements). Examples of titles included in this category are Professor, Associate Professor, Assistant Professor, Research Associate, Research Faculty, Postdoctoral Research Associate, Postdoctoral Research Fellow, Research Scientist, Principal Investigator, Investigator.

Staff: Technical/Clerical (A2)

This category includes the salary and associated fringe benefit cost of technical and administrative support staff direct programmatic effort on research contracts and grants (includes amount funded by the grant or contract plus amounts funded through cost sharing arrangements). Examples of titles included in this category are laboratory technician, lab manager, data entry operator, research assistant, research technician.

(A3) Students: Graduate/Undergraduate

This category includes the salary and associated fringe benefit cost of graduate and undergraduate student direct programmatic effort on research contracts and grants (includes amount funded by the grant or contract plus amounts funded through cost sharing arrangements). Examples of titles included in this category are graduate research assistant, undergraduate research assistant, cooperative students, summer student interns.

(A4) Other

Salaries and fringe benefits classified as "Other" should be described in an attachment to the template.

(A5) Equipment Purchases on Contracts/Grants

This category includes the acquisition cost of capital equipment items purchased directly from contract and grant funds or funded through cost sharing arrangements. Depreciation of equipment used in labs, but NOT purchased directly from contract/grant funds is included in "Facility/ Equipment Depreciation or Use Allowance, see Note (F)

Other Direct Costs (A6)

This category includes all costs other than salaries and fringe benefits and equipment purchases that are incurred for the direct benefit/use of research contracts and grants or funded through cost sharing arrangements. Examples of items are lab supplies, travel for contract personnel directly related to contracts, research subcontracts and other items directly identified to the contract.

Research Lab/Dept Support Cost **(B)**

For universities, this column includes costs incurred within the research units and within the academic division administrative structure of the university that support the sponsored research activity within the research unit. These costs are not charged directly to individual research contracts and grants and are generally referred to as "departmental administration" in the language of Office of Management and Budget Circular A-21. The costs are accumulated and allocated to all functions of the research units based on the level of expenditure activity of each function: research, instruction, public service, and other institutional activities. The costs allocated to research are then averaged across all research contracts and charged to contracts and grants using an average percentage rate.

Total Cost of Research Template Narrative Description and Notes

Industry comparable term is UNAPPLIED personnel assigned to labs, but not directly charged to contracts. Examples include secretaries, administrative assistants, building administrators and lab managers assigned to labs.

Scientist/Faculty/Postdoc (B1)

This category includes the salary and associated fringe benefit cost of scientist/researcher effort that supports the overall research mission of the research unit, but is not directly related to any one research contract or grant. To the extent that a portion of this support effort is devoted to non-research activities, it should be excluded from the template. Only the cost of effort allocable to research should be included in the template.

Staff: Technical/Clerical (B2)

This category includes the salary and associated fringe benefit cost of technical and clerical support staff that supports the overall research mission of the research unit, but not directly related to any one research contract or grant. To the extent that a portion of this support effort is devoted to non-research activities, it should be excluded from the template. Only the cost of effort allocable to research should be included in the template.

Students: Graduate/Undergraduate (B3)

This category includes the salary and associated fringe benefit cost of graduate and undergraduate students that support the overall research mission of the unit, but are not directly related to any one research contract or grant. To the extent that a portion of this support effort is devoted to non-research activities, it should be excluded from the template. Only the cost of effort allocable to research should be included in the template.

(B4)Other

Salaries and fringe benefits classified as "Other" should be described in an attachment to the template. To the extent that a portion of this support effort is devoted to non-research activities, it should be excluded from the template. Only the cost of effort allocable to research should be included in the template.

Other Direct Costs (B5)

This category includes supply and expense (non-salary) items that support the overall research mission of the unit, but are not directly related to any one research contract or grant. To the extent that a portion of these support costs is devoted to non-research activities, it should be excluded from the template. Only the cost of effort allocable to research should be included in the template.

Operations and Maintenance (C)

Operations and Maintenance costs are those incurred for the administration, supervision, operation, maintenance, preservation and protection of the university's physical plant. They include expenses normally incurred for such items as janitorial services, repairs of buildings, furniture and equipment (that are not capitalized), care of grounds, maintenance of buildings, security, earthquake and disaster preparedness, environmental safety, hazardous waste disposal, property, liability and all other insurance relating to property, facility planning and management. These costs are allocated to research, instruction, public service, and other institutional activities. Only the amount allocable to research should be included in the template.

The definition for industry is the same. To the extent that a portion of the research facility is devoted to non-research activities (i.e., production), it should be excluded from the template. Only the operations and maintenance costs allocable to research should be included in the template.

(D) Utilities

Utility costs are costs allocated to research for electricity, fossil fuels, water and sewer and other utilities. To the extent that a portion of utility cost is devoted to non-research activities, it should be excluded from the template. Only the cost of effort allocable to research should be included in the template.

(E) Interest on Major Construction

Interest on major construction that is not capitalized is included to the extent that the asset for which funds are borrowed is used for research.

Industry may not be able to separately identify this cost. This cost may be included in certain "home office" fees that are assessed to the research division and included in General Administration, see Note (H).

(F) Facility/Equipment Depreciation or Use Allowance

This category should include only the cost of facilities and equipment that is allocable to research. In accordance with federal regulation, universities may either compute depreciation or use a standard recovery rate of 2% for buildings and 6 2/3% for equipment.

The definition for industry is the same except there is no standard recovery rate.

(G) Library costs should include only those library costs that are allocable to research.

Comparable costs for industry are costs incurred to support collections of books, journals, and publications for the support of the contract research activity.

(H) General Administration
General Administration includes that portion of central management costs allocable to research. For universities, the allocation of central management cost is

based on the level of expenditures for research contracts and grants compared to the level of expenditures for instruction, public service, and other non-research activities.

Industry comparable costs include items such as home office costs, personnel, payroll, accounting, legal, computer system, purchasing, and disbursement costs that support contract research. For industry, initial phases of the this study highlight the need for specific detail on this cost category due to the variety of costing treatments used in industry for home office costs. Therefore, for our industry participants, we ask for the following additional information:

- Describe your company's policy and practice regarding the allocation of 1. home office costs to
 - a. divisions. and
 - b. activities within divisions.
- Described whether the policy and practice described above is consistent 2. with the Disclosure Statement required by the Cost Accounting Standards Board.
- Sponsored Programs Administration **(I)**

This categor, includes costs incurred to review and facilitate completion of proposals for research contract and grants. It also includes the cost of accounting for research contracts and grants, including the filing of government-required forms to report expenditures, equipment inventories, etc. The cost of communicating research contract and grant opportunities to researchers is included in this category along with the cost of special review committees required by government regulation, e.g. animal care and human subject review committees.

Industry comparable costs are those incurred for marketing and contract administration. For industry, this cost may be a set percentage of total contract costs on external projects.

Student Services ഥ

This category consists of a small portion of costs incurred to support graduate and undergraduate students working on research contracts and grants. Industry has no comparable cost.

Other

Please attach explanatory notes for any amounts classified in this category.

Summary

The purpose of the template is to identify the total cost of research. The separation of costs into various types of cost will provide a means for testing comparability of data and to identify and correct possible anomalies. The review and comparison will be conducted in confidence by Arthur Andersen.