Higher Education Research and Development (HERD) Survey Workshop:

Capital Expenditures and R&D Personnel

September 16–17, 2019

Summary and Next Steps

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by

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Contents

The National Center for Science and Engineering Statistics (NCSES) within the National Science Foundation (NSF) hosted a workshop on September 16–17, 2019 at the NSF building in Alexandria, Virginia. NSF invited representatives from ten universities to an in-person session with NCSES staff to talk about the reporting of capital expenditures for research and development (R&D) and R&D personnel data on the Higher Education R&D Survey (HERD).

After some opening remarks from Emilda Rivers, the NCSES director, the university participants and attendees from NCSES and ICF introduced themselves. The workshop participants represented a diverse set of universities that complete the annual HERD survey, including four private and six public universities ranging in size from close to $7 million in annual R&D expenditures to over $800 million. The participants all contributed to the completion of the HERD survey, some as preparers and some as reviewers. Three had only been involved in the completion of the survey for one to three years, two had contributed to the completion of the survey for 4-9 years, but five participants had been involved with the completion of the survey for 10 or more years. Participants came from various university administration offices including the offices of research administration, sponsored projects, institutional research, and controller.

John Jankowski, (NCSES Director of the R&D Statistics Program) and Michael Gibbons (NCSES project officer for the HERD survey) led the workshop. Michelle Heelan from ICF, the contractor that administers the survey on behalf of NCSES, facilitated the meeting, and Kathryn Harper (ICF project director) participated in the discussion.

Background and High-Level Goals

After introductions, Mr. Jankowski provided some background information and high-level goals for the workshop. He briefly reviewed some of the R&D statistics collected at NCSES, specifically noting the collection of statistics across economic sectors and how R&D statistics are used by policy-makers. He then introduced the Frascati Manual.[1] The manual is published by the Organisation for Economic Co-operation and Development (OECD) and is the internationally recognized methodology for collecting and using R&D statistics. Mr. Jankowski explained that one of the drivers of the workshop was to make the collection and reporting of R&D statistics in the United States comparable to international statistics, as guided by the Frascati Manual. He said that there are many topic areas where the United States leads in providing the guidance for what is collected and how it is collected, but there are still areas without uniform reporting worldwide. One of the areas where there is the greatest divergence between the HERD survey and the Frascati Manual guidance is the treatment of "capital use for R&D." He noted that the United States is the only country in the world that does not follow the guidelines in the Frascati Manual for reporting capital use for R&D. He clarified that in the guidelines, the measurement of higher education R&D includes operating expenses for R&D and capital R&D expenses (e.g., land, buildings, major pieces of equipment), but specifically excludes depreciation. He noted that depreciation is currently included in HERD as a component of indirect costs. The workshop will help NCSES determine whether it can collect additional information that makes higher education statistics more internationally comparable.

[1] OECD (2015), Frascati Manual 2015: Guidelines for Collecting and Reporting Data on Research and Experimental Development, The Measurement of Scientific, Technological and Innovation Activities, OECD Publishing, Paris, https://doi.org/10.1787/9789264239012-en.

Mr. Jankowski also told participants that the purpose of this workshop is just to gather information and gain a better understanding of the relations between data currently reported on HERD and international guidelines. He assured participants that the discussions at this workshop would not be the final determinant that any specific change to survey would be made. This was a message reiterated throughout the workshop. Participants should not consider any discussions in the workshop to be evidence that a change to the survey is going to be made. Mr. Gibbons added that there would be additional interviews conducted with survey respondents before deciding on a course forward.

Mr. Gibbons discussed the types of capital expenditures reported on the HERD survey and the Survey of Science and Engineering Research Facilities (hereafter referred to in this document as the Facilities survey). The Facilities survey is another survey of universities and colleges directed by NCSES. The survey is conducted biennially and collects data on the amount, construction, repair, renovation, and funding of research facilities. Mr. Gibbons distributed a document summarizing the capital expenditures (CapEx) collected on both surveys, highlighting the CapEx components not measured on either survey (see appendix A). The HERD survey collects expenditures on capitalized R&D equipment purchased from current operating funds in R&D accounts. The Facilities survey collects expenditures or projected expenditures from capital project accounts for 1) repairs and renovations and 2) new construction of science and engineering research space. Mr. Gibbons highlighted capital expenditures for R&D not currently collected on either survey, including land purchased for R&D use, purchased research space, expenditures for equipment-only awards, and expenditures of intellectual property.

Mr. Gibbons and Mr. Jankowski also prefaced a topic that will be discussed later in the workshop: "Are there equipment costs that are too large to be included on the HERD survey, considering that expenditures come from an institution's current operating funds?" Mr. Gibbons gave some examples of very large expenditures reported on HERD in recent years, including a research vessel, a supercomputer, and a giant telescope.

Before proceeding further, Dr. Heelan reviewed the broad goals included in the agenda (see appendix B) and invited the participants to review the more detailed goals. She then went over the agenda, explaining that some of the longer sessions would be broken up by paired activities, where partners would work together to complete a worksheet (see appendix C for all worksheets) and share their experiences. She explained that the pairs would be asked to share with the group, but there would also be larger group discussions.

Some topics were discussed multiple time during the course of the workshop. In this summary report, we attempt to summarize all of these conversations under unified headings, rather than in chronological order.

Capital Expenditures

Capitalized Equipment from Current Funds

Before addressing questions about how measurements of capital expenditures could be expanded, participants were asked to share their process for reporting R&D expenditures for capitalized equipment on the most recent HERD survey, including:

- At what point, and by whom, was an expenditure, or the project associated with that expenditure, categorized as R&D?

- Are internally funded R&D expenditures for capitalized equipment included in the HERD survey? How is the process for identifying those expenditures different than the process of identifying externally funded R&D equipment?
- How easy or difficult is it to account for capitalized equipment?
- How confident are you that all capitalized equipment is accounted for?

Participants worked in pairs to answer these questions and then shared with the larger group. Most participants described a process where expenditure data were pulled directly from an accounting system where there is a function code indicating that a particular account is for R&D and another code for capitalized equipment. One of the smaller institutions, in terms of R&D expenditures, had a more manual process. Participants felt confident that they were accurately reporting capitalized equipment purchased as part of a sponsored project because those projects were coded as R&D at the time of setup. Several participants felt that internally financed equipment purchases might be underreported, because they were purchased from accounts not designated solely for R&D. They may not have been coded as R&D because it was a multi-function account or there was an error at the time of setup. This was complicated for some institutions that had to combine data from different units (e.g., university foundations) to complete the survey.

Identifying and Removing Expenditures for Depreciation

Institutions were also asked how they would identify and report the amount of indirect costs reported on the HERD survey that were for depreciation. This is a task that participants had no experience with, in the context of the HERD survey. Currently, depreciation is included on the survey as a component of indirect costs; it is not separately reported. Additionally, the HERD survey asks that indirect costs only be reported for externally funded R&D, not institutionally financed R&D. Again, participants were asked to work in pairs to share their hypothetical process, consider how difficult it would be to implement, and express how confident they would feel about the reported value. Participants then shared their discussions with the larger group.

When the topic of depreciation was first discussed after the first round of paired work, most participants said that they would start with the depreciation amount for the reference fiscal year, which is typically a single year-end expense that is charged to one fund code. Some participants did not know how they would breakdown that one number into specific depreciation amounts for specific R&D assets; this was usually because they were not personally involved in asset management and depreciation. Other participants suggested using the depreciation schedule, but they acknowledged that matching up the plant fund records (where depreciation is tracked) with current-year expenditures would be a potentially difficult manual process.

Others suggested that because the indirect costs reported on HERD are based on the negotiated F&A rate, each institution would have to refer to their F&A proposal and determine the portion of the indirect costs detailed in the proposal that were for depreciation. Related to that, participants noted that the depreciation included on HERD has no relationship to the actual depreciation expense on R&D equipment in the current fiscal year. The indirect costs reported on the HERD survey are calculated based on the institution's negotiated F&A rate, which may have been finalized three or more years ago.

The topic of depreciation was revisited a few times during the course of the workshop. In early conversations, participants were not sure how the calculation of the deprecation part of indirect costs

would be accomplished, but they thought that they might be able to create a new process. However, as the conversations continued and participants shared potential hurdles, the path to calculating and removing depreciation from indirect costs became more complex and burdensome, and the perception from university participants indicated that numbers would be unreliable.

Throughout the workshop, as the discussion moved to new areas of capitalized expenditures, Mr. Jankowski returned to the topic of depreciation to better understand the relationship between deprecation and what is currently reported on the HERD or Facilities surveys, or what might be collected on the surveys in the future.

- Mr. Jankowski asked if there may be some over-reporting of capital equipment expenditures from current funds over time, and participants agreed, but they thought that the amount of error was very small and the methods of estimating might differ greatly due to the varying systems and capabilities of individual institutions.
- Participants considered the question: "If we had a real annualized amount spent on buildings and major pieces of equipment, all for R&D, over 15 years, would we get the same total if we got rid of depreciation and just asked for all R&D equipment and construction/project costs separately?" The participants pointed out that the F&A proposal is a look back at prior year depreciation charges. It has no relevance to current depreciation. However, in the aggregate there would probably be some way to estimate how much bias there is across all the institutions to be able to make a statistical adjustment.
- Participants also considered the question: "Are there any buildings and major pieces of equipment that are being depreciated, and therefore included in reported indirect costs, that would NOT be considered R&D as collected in one of the surveys?" A participant responded that depreciation is based on space usage. If space isn't used for R&D, it won't be depreciated.
- Mr. Jankowski also asked if offices for research administration would be considered R&D space. The group agreed that it would not.
- Mr. Jankowski asked if depreciation calculations on the F&A proposal included any facilities that aren't really for R&D use? Everyone agreed that any facilities included on the F&A proposal would be for R&D.

Capital Projects

During another paired work session, participants were asked to discuss their process for tracking capital projects. All participants said that there was a set definition at their institution to determine if a project, internally or externally funded, was a capital project. In a later discussion, participants said that this is based on the nature of the final deliverable. When asked how they made sure those projects were not included on HERD, all participants stated that projects are created in completely different funds (e.g., plant funds) that do not intermingle with current fund accounts. Several institutions reported having capital projects that were classified as R&D (i.e. would be on the Facilities survey, but not on the HERD survey). Institutions with less R&D did not have R&D capital projects. Lastly, institutions were asked if they had externally sponsored capital projects. Ms. Harper offered the example of collaborative projects between two or more universities where the state or federal government might have provided initial capital as part of a government initiative. Participants noted that most capital projects are financed through institution funds, but if there was a sponsored capital project, it would go through an approval process and then be identifiable and excluded from the HERD survey.

Response to Sample Questions Asking for All CapEx

During the workshop participants were asked to provide feedback on two sample questions that asked for all capital expenditures (e.g., land, building, equipment) (see appendix D). Participants first responded to Sample Question 1, which asked for capital expenditures for R&D in five categories: land, building, machinery and equipment, capitalized software, and intellectual property products. All participants said that their institution did not track intellectual property and therefore it could not be reported.

Participants also thought that land for R&D would be very difficult to report because they rarely buy land knowing what it is going to be used for. A participant also noted that an institution might purchase land for R&D but will have to wait a few years for funds to be available to build the research building on-site. She asked when those expenditures should be reported, when you buy the land or when you put it into service.

A few participants noted that to determine the R&D expenditures for mixed-use buildings the total cost of the building would have to be prorated by the percentage of space used for R&D. That percentage would be based on the space survey conducted by each institution in preparation for the F&A proposal. Mr. Gibbons reminded the participants that building expenditures are already collected on the Facilities survey, although there are some limitations on the data due to limited reference periods and thresholds for reporting. He said that NCSES is trying to understand the overlap and missing expenditures between the two surveys.

A couple workshop participants mentioned that they do not track capitalized software, so they can't report expenditures in that category. In a follow-up question, Mr. Jankowski asked if there are expenditures for R&D software missing from the HERD survey? One participant said, "There could be some from internal funding that we don't identify as R&D, but anything that is marked as research we would pick up." The participants were asked if there could be a capitalized software purchase that would not be reported on the HERD survey because it was part of a capitalized project account. Some participants thought that could occur.

Later in the workshop, participants were asked for feedback on another sample question, Sample Question 2, which asked for all CapEx by source of funding (federal/nonfederal) and field or R&D. Participants said that it would be difficult to split building and land expenses across fields. A smaller institution said that it could be done solely because the participant can sit down with deans to do allocations, an option that large institutions might not have. Mr. Jankowski noted that the schools already report expenditures by field, and presumably they could use the same approach to report all CapEx. Participants said "no," because currently on the HERD survey most things are on projects associated with specific faculty members, and that would not be the case with capital projects.

Equipment-only Awards

In pre-work completed by participants prior to the workshop, they were asked if they excluded equipment-only awards. Some said "yes" and some said "no." Dr. Heelan asked how the institutions that excluded those expenditures knew to exclude those funds. All institutions that excluded the funds said that they knew to do that because the survey review team identified those expenditures and asked for their removal, explaining that those awards are not for research "activity."

Dr. Heelan then asked if the exclusion of those awards was appropriate. After a lengthy discussion, all participants agreed that very large expenditures (whether just for equipment or not) should not be excluded based on a cap or a percentage of equipment. Most participants acknowledge the spikes that this might produce in trend data ("lumpiness"). Participants noted that if the same equipment purchased on an equipment-only award were included in an award with even a small amount of "activity" included, the expenditures from that award would be permitted on the HERD survey. One participant suggested adding a question asking for the amount of equipment expenditures that were for equipment-only awards. She and other participants projected almost no burden involved in that question, and the data from the question would explain large spikes in equipment expenditures. Participants noted that large increases should instigate survey staff reviews (as they already do) to ensure they are being reported appropriately.

A participant suggested that NCSES seems to be doing two things with the same number, "one is using R&D expenditures as a proxy indicator of research activity, and the other is investment in research." "You are trying to accomplish multiple goals. There is no one technical solution that is going to meet that goal." It was further suggested that CapEx be collected separately from other R&D expenditures.

Large Purchases Not Capitalized

As part of the effort to learn more about large spikes in expenditures reported on the HERD survey and ways to address them, participants were asked, "If your institution was awarded the lead on a large grant to build a center for an off-site research consortium that would be owned by a new nonprofit, how would the affiliated expenditures be reported on the HERD and/or Facilities surveys?" During the discussion, several institutions talked about the collaborations they have with other institutions where the two institutions share research space and split operational costs. There was a lot of discussion about how to manage ongoing costs, but when one participant pointed out that they had not discussed how to report the initial large investment, participants either did not have a suggestion or said that they would just report the expenditures in total as current fund expenditures. It was again suggested that CapEx be collected separately from other R&D expenditures.

Mr. Jankowski asked how expenditures would be reported if the construction was managed by a subawardee. Two participants said that it would be reported as passthrough expenditures. When asked if they would do it another way, no one responded.

R&D Personnel

The second day of the workshop focused on the reporting of R&D personnel. Mr. Jankowski provided some background on the day's discussion. He said that the HERD survey collects headcounts of R&D personnel paid from salaries reported as part of R&D expenditures. The HERD survey asks for the number of private investigators (PIs) and "other personnel."

The Frascati Manual has a full chapter on measuring R&D personnel and measuring FTEs, headcounts, and costs. R&D personnel is comprised of three categories: researchers, technicians, and R&D support personnel (those integral to the effort but not lab workers). The manual also says that countries should report the Full Time Equivalents (FTEs). NCSES uses PI headcounts as a proxy for "researchers." NCSES does not have any FTE counts for R&D personnel for the higher education sector. NCSES collects FTEs and headcounts for the business sector for all three categories. The United States is the only country that does not report FTEs in the higher education sector in the Main Science and Technology Indicators

produced by OECD, which includes data from member countries and observer countries. He said that the workshop will help NCSES better understand its current data, and the potential to derive FTEs for these researchers, technicians, and R&D support staff.

R&D FTEs

During a paired work session, participants were first asked how the headcounts for PIs and other personnel paid from the R&D salaries, wages, and fridge benefits were determined when they completed the FY 2018 HERD survey. Most of the participants mentioned querying the payroll system for individuals paid from R&D project accounts. Typically, a code identifying the person as a PI is pulled from another system and matched to payroll. Any individual who was not a PI is counted in "other personnel." For some institutions this information can be easily pulled. For other institutions, particularly smaller ones, the process takes more manual effort.

Two institutions download payroll from sponsored projects. In both of those cases, they do not capture anyone paid from institutionally financed research. Ms. Harper asked if the institutions that reported headcounts for internally funded research personnel had internally funded PIs or if "PI" is a designation limited to sponsored projects. Only one institution had internally financed PIs. At that institution, a separate account is set up for all projects and the person with the authorization to approve expenditures on that account is the PI.

Several institutions thought that they were underreporting the headcount of their PIs because the institutionally financed portion of their salaries for R&D is not separately accounted for and can therefore not be reported as R&D expenditures.

After describing their current process for reporting headcounts for R&D personnel, participants were asked how the process would change if they were asked to report FTEs. Participants believe they could get the necessary raw data. Most mentioned using effort reports and merging that with payroll information. Most participants also mentioned having to consult with the Office of Human Resources (HR) on what was possible. The biggest concern for participants was not knowing how NCSES would want them to calculate an FTE. The unit of time they use to measure an FTE is not typically twelve months. It might be the length of an academic year (10 months or 9 months), or it might be only be a few months representing an academic quarter. An example was provided of a full-time faculty member who also gets a salary during the summer for research performance, which would be calculated as a 1.33 FTE. Additionally, students who received stipends or assistantships to conduct research would not necessarily have a standard or expected number of hours, so calculating FTEs for students would require some assumptions.

When asked if they could split "other personnel" (i.e., non-PIs) to pull out students, some participants said that it would be difficult because there aren't consistent job titles used in their HR system. They could not easily identify which job titles belong in each category.

Demographics for R&D Personnel

For the last topic discussed at the workshop, Dr. Heelan asked participants about the feasibility of collecting demographics for R&D personnel. All institutions said that it would be relatively easy, except perhaps for graduate students because they don't report that. Schools report demographic data of faculty and staff on IPEDS. It is also published in university fact books. They would have to work with the Institutional Research Office to get those data, but they didn't think it would be a problem. They would

have to provide IR with the list of R&D personnel to look up in their records. If NCSES is interested in compensation, the data could easily be provided by public universities where that data is public record. The private universities thought that the provost would probably not approve that.

Next Steps

Below we recommend some possible next steps towards the collection or estimation of HERD data in the key topic areas discussed at the September 16-17, 2019 workshop. For measures of R&D personnel, the process of developing survey questions can move forward with approval from NCSES. However, some details of question will require feedback from NCSES to make sure the needs of data users within the Center are met. We recommend only a few minor changes to the HERD questionnaire related to the collection of capital expenditures at this time. However, we do recommend areas for additional investigation or decision making that could result in more extensive changes to the data collection.

Capital Expenditures: Collecting all capital expenditures for R&D

During the workshop, participants were asked for feedback on two sample questions that asked for all capital expenditures for R&D (current funds and capital projects) in a specific fiscal year. The first question asked for capital expenditures by category of expense (land, buildings, machinery and equipment, software, and intellectual property). The second question asked for expenditures by source for funds (federal and nonfederal) and major fields of R&D (e.g., engineering, life sciences, and social sciences). None of the institutions that participated in the workshop tracked intellectual property purchases and they did not know how they might find that value.

Additionally, the workshop participants had very little confidence in their institution's ability to identify and report current-year R&D expenditures for land or buildings. The biggest concern was the institution's inability to identify land and building spaces, or portions thereof, as being for R&D (versus instruction or administration) in the year the expenditure occurred. According to workshop participants, land is frequently purchased long before it goes into service. Similarly, the expenditures for building construction can spread across a few years, and the portion of the building that will be used for R&D may not be known for a few years after the construction begins. Additionally, workshop participants did not think that they would be able to report these same expenditures by fields of R&D for the same reasons; they wouldn't know the fields of R&D conducted on the land or in the building until the building was in service and a space survey was done.

To collect expenditures from capital projects for R&D use, NCSES will likely have to rely on retrospective survey questions, which ask for capital project expenditures from 2-4 years in the past, or design a questionnaire where respondents are comfortable reporting rough estimates for the most recent fiscal year. After a few years of data collection, past years' R&D expenditures from capital projects could be used to derive valid estimates of national expenditures in the most current fiscal year. The Facilities survey already has a retrospective aspect to it, and given that respondents on that survey already report construction/renovation costs for R&D by field, we suggest doing additional interviews or workshops with Facility survey respondents to see what they think might be possible to collect and how to clearly define it for accurate reporting. Alternatively, questions asking for rough estimates of current year capital project R&D expenditures, or more precisely measured expenditures from 3-4 years in the past, could be tested with HERD respondents. The important thing would be to distance, on the

questionnaire, the data collected for capital project expenditures from the highly precise current year fund expenditures that HERD respondents are committed to provide.

Capital Expenditures: Removing depreciation

Workshop participants did not have clear suggestions about how to exclude depreciation for indirect costs, at least not within the current structure of the HERD Survey. They agreed that double counting of research equipment expenditures over a multi-year period was possible, but did not think that there was a way to appropriately remove depreciation from a report of current-year expenditures. During the workshop, participants said that the depreciation included in reported indirect costs had no relation to the equipment cost reported in the current year.

We have two suggestions for how NCSES could proceed. First, to gauge the level of double counting of equipment expenditures within the population, NCSES could conduct a separate study to 1) learn more about what types of equipment expenditures are included in F&A proposals (the source of depreciation expenditures in the HERD survey) and 2) measure the amount of double counting between equipment included on F&A proposals and equipment reported on the HERD survey for representative sample of institutions. NCSES could contract with an accounting firm that specializes in assisting universities with F&A proposals. In addition to providing professional guidance on the types of expenses included in depreciation estimates, the firm could perform a type of audit with sampled institutions where they compare the depreciated equipment included it the F&A proposals to equipment expenditures reported in recent years of the HERD survey. To make sure the results are timely and accurate, NCSES would want to sample universities or colleges that completed their F&A proposal over the past year.

Alternatively, NCSES could reconsider how indirect costs are reported on the HERD survey. The reason institutions have a hard time removing depreciation from indirect costs is because the indirect cost is based on an outdated percentage. If schools were instead asked to estimate current-year actual indirect cost, not as percentage but as an actual dollar amount, they could then remove the amount for depreciation without feeling like they were comparing apples to oranges. This would be a significant change for the institutions and would likely be burdensome.

Capital Expenditures: Reporting Equipment

In addition to measures of depreciation and total capital expenditures, NCSES asked participants about some capital equipment reporting that might be producing survey error, or, at a minimum, concern among university data users. Specifically, universities were asked about very large equipment expenditures that were creating peaks in longitudinal data. The expenditures were not for capital projects, which are excluded from HERD, but had expenditures that size of a capital project. Although participants were sympathetic to the “lumpiness” these very large expenditures created in the trend data, they did not think establishing a cap to limit the size of individual expenditures reported was justified. As long as an expenditures is for R&D and is from current fund accounts, it should be permitted to be reported. Participants for larger institutions thought a cap would impact them unfairly. Participants suggested that NCSES follow up with institutions reporting these large expenditures, as NCSES has been doing, to verify that expenditures are being properly included in HERD and to get as many details as possible about the nature of the expenditures.

Participants were also asked about equipment-only awards. NCSES currently asks that respondents not report equipment-only awards because those awards are not considered R&D accounts, since they do

not included R&D activity. However, the guidance has only been provided to institutions in the context of data review follow-ups or in a webinar in 2018. There is nothing on the HERD survey instructing institutions to exclude equipment-only awards. Workshop participants did not think those awards should be excluded. Participants noted that if the same equipment purchased on an equipment-only award were included in an award with even a small amount of "activity" included, the expenditures from that award would be permitted on the HERD survey. We recommend for the FY 2020 survey that the exclusion of equipment-only awards ends; it is hard to justify the continued exclusion of these awards when very large equipment expenditures continue to be reported.

To address "lumpiness" in the data, participants suggested pulling capitalized equipment expenditures out of R&D activity expenditures and conducting a separate collection for CapEx. Although a survey or survey module that collects all CapEx (current fund and capital projects) may be at least a couple years away (see discussion above), removing capital equipment expenditures from the R&D activity total on the current HERD survey would be relatively simple. On the HERD questionnaire it would only require some instruction changes and the removal of capital expenditures from Question 12 of the survey.

Pulling capital expenditures out of R&D activity would likely address some of the problems the HERD survey has experienced with large spikes in expenditures due to very expensive equipment included in the R&D project or equipment-only awards. However, this change would create trend breaks in R&D total expenditures (e.g., Would the total R&D only be for activity [no CapEx] or would it include all CapEx?) and another series of data tables. NCSES may want to consider this as an option in future years.

Research Personnel: FTEs

Knowing that this is a high-priority for NCSES, and participants said that it was possible to do—although it was easier for some institutions than others—we would recommend moving forward with designing a question to add to the HERD survey asking for R&D FTEs by job type. However, in addition to cognitive interviews, we would recommend a small pilot study where schools are asked to complete the question and provide feedback on the process for completing the question, what assumptions they made when calculating FTEs, and what roadblocks they encountered. The cognitive interviews and the pilot can be coordinated. For example, participants can give initial feedback to first viewing of the question during a cognitive interview and then get back to us in a month with the completed question and feedback on the process.

Several workshop participants asked for some very specific directions on how to calculate FTEs and classify job types. Although these directions can be drafted using guidelines and other surveys (e.g., Frascati Manual and BRDIS), the feedback provided during a pilot tests would likely be necessary to tailor the directions to the unique circumstance of the U.S. higher education sector.

Lastly, NCSES should begin an internal discussion of whether FTEs need to align with R&D salary, and if they do not, what restrictions should be put on the inclusion of faculty or staff members as R&D personnel. During the workshop, several participants noted their belief that the R&D personnel were being undercounted because they needed to be tied to separately accounted-for R&D expenditures rather than effort or project reporting. Our understanding of the Frascati Manual is that expenditures and FTEs do not necessarily have to be associated, at least as expenditures are currently being reported on the HERD survey.

Research Personnel: Demographics

These were the data that the workshop participants were most confident they could provide. We would recommend moving forward with designing a question to add to the HERD survey. Workshop participants recommended modeling demographic categories off the questions they already compete for IPEDS, assuming that they do not conflict with NCSES standards. Although the instructions on this question will likely need less detail than what will be needed for FTEs, we recommend cognitive and pilot testing be done simultaneously with the FTE question. We assume that the job categories requested on both questions will need to be aligned. For that reason, it would be best to test at the same time.

After NCSES has reviewed recommendations and chosen priorities ICF will propose a long-term project schedule to guide management of more detailed tasks completed by ICF or other contractors.

APPENDIX A: CapEx on the HERD and Facilities Surveys

Collecting capital expenditures: HERD vs Facilities Survey

HERD

Collects expenditures for R&D activities from an institution's current operating funds that are separately accounted for, including . . .

- software purchases (noncapitalized and capitalized),
- capitalized equipment (movable equipment exceeding the institution's capitalization threshold [typically $5K]),
- equipment purchased from R&D accounts,
- depreciation of capital assets in the F&A calculations.

Data are for a single fiscal year.

Facilities

Collects expenditures (and/or projected expenditures) for (1) repairs & renovations and (2) new construction of S&E research space, including . . .

- any single field with at least $250K in expended or anticipated completion costs,
- fixed equipment within the research space (included in overall expenditures),
- movable equipment that costs $1M or more (included in overall expenditures).

Costs are collected for projects started during two-year periods: most recent 2-years for expended funds, upcoming 2-years for planned expenditures. Projects may take longer than 2 years.

Field data are prorated.

Costs for the portion of nonresearch space are excluded.

What's missing?

- Research equipment purchased from accounts that are not specifically for R&D
    - Equipment-only awards
    - Internal university accounts
- Land purchased for R&D use
- Purchased research space
- Other intellectual property products (purchased patents, long-term licenses, or other intangible assets used in R&D that are in use for more than one year)
- Other expenditures?

Other questions?

- Are there equipment costs that are too large for HERD, considering expenditures come from an institution's current operating funds?
- Is all noncapitalized equipment included in "other direct costs" on HERD?

APPENDIX B: Workshop Agenda

NSF Higher Education Research and Development Survey (HERD) Workshop

September 16-17, 2019

National Science Foundation

Agenda

September 16, 2019 9:00am – 4:00pm

Time	**Activity**
8:30 – 9:00am	Breakfast
9:00 – 9:20am	Welcome by Emilda Rivers, Director of National Center for Science & Engineering Statistics (NCSES) Introductions *Participants share their (a) organization, (b) current role, (c) years of involvement in the HERD Survey, and (d) role in the HERD Survey (e.g., respondent, contributor, etc.)*
9:20am – 9:30am	Workshop Day 1 Goals 1. Deepen NCSES's understanding of how schools are capturing expenditures for items other than direct labor. 2. Improve the comparability of HERD and Facilities Survey data. 3. Identify areas where changes can be made to the HERD survey to improve international comparability. To accomplish these central goals, NCSES seeks to understand: • How schools define and identify capital projects and other capital costs; • What large capital purchases have been reported on HERD, but perhaps not reported on Facilities; • How schools identify depreciation costs and whether these can be separated from other indirect costs; • What depreciation costs have been reported on HERD for capital expenditures reported earlier on HERD, for capital expenditures perhaps reported on Facilities, for capital expenditures never reported on either survey; • How schools calculate capital equipment expenditures; • How schools account for equipment purchased from equipment-only awards; and • How schools ensure capital projects are excluded from the HERD survey

9:30am – 10:50am	Capitalized Equipment (Question 1) and Depreciation (Question 5)
10:50am – 11:00am	BREAK
11:00am – 11:50am	Capital Projects (Question 3)
12:00pm – 1:00pm	LUNCH
1:00pm – 1:15pm	Group Discussion • Burning questions • Valuable input
1:15pm – 3:00pm	Equipment-Only/Instrumentation-Only Awards (Question 2) and Non-Capitalized Large Purchases (Question 4)
3:00pm – 4:00pm	Group Discussion • Burning questions • Valuable input Day 1 Progress Recap

September 17, 2019 9:00am – 12:00pm

Time	Activity
8:30 – 9:00am	Breakfast
9:00 – 9:30am	Check-In & Review of Workshop Day 2 Goals *Participant Check-In: Participants share their biggest unanswered/unresolved question/comment from Day One (2 minutes max lightning round)* Workshop Day 2 Goals: 1. Deepen NCSES's understanding of how schools are R&D personnel counts. 2. Identify areas where changes can be made to the HERD survey to improve international comparability. To accomplish these central goals, NCSES seeks to understand: • How schools calculate the number of Principal Investigators; • How schools determine the number of all other personnel paid from R&D accounts; • How best to identify the type of labor these other "R&D personnel" provide (e.g. whether as researchers, technicians or other supporting staff); • Whether demographic characteristics of R&D staff could be estimated (e.g., sex, degree obtainment); and • How one might go about estimating the full-time equivalence of PIs and other R&D personnel
9:30am – 10:55am	Personnel/FTEs (Questions 6-7)
10:55am – 11:10am	BREAK
11:10am – 11:55am	Availability of demographic characteristics of R&D personnel
11:55am – 12:15pm	Wrap-Up & Next Steps

APPENDIX C: Worksheets

Your Name:

Your Institution:

Topic: Capitalized Equipment

Key Questions

On question 12 of the FY 2018 HERD survey, we asked for the amount of R&D expenditures for capitalized equipment.

a. Share your institution's process with your partner. Compare and contrast your processes and record at least 2 'take-aways' you believe would be useful for NSF to know.
b. At what point, and by whom, was an expenditure, or the project associated with that expenditure, classified as R&D?
c. Are *internally* funded R&D expenditures for capitalized equipment included on HERD? How is the process for identifying those expenditures different from identifying externally funded R&D equipment?
d. How easy or difficult is it to account for capitalized equipment?
e. How confident are you that all capitalized equipment is accounted for?

Response to Key Questions

Your Challenges	**Your Suggestions**
1.	1.
2.	2.
3.	3.

Other Comments/Input:

Your Name:

Your Institution:

Topic: Depreciation

Key Questions

Depreciation is included in the indirect costs reported on the HERD survey. The HERD survey asks that indirect costs only be reported for externally funded R&D, not institutionally funded R&D.

a. Share with you partner how your institution would identify and report the total amount of indirect costs reported on the HERD survey that were for depreciation. Compare and contrast your processes and record at least 2 'take-aways' you believe would be useful for NSF to know.
b. How difficult would it be to identify indirect costs that were for depreciation?
c. How confident would you be in the values that were being reported?
d. How much do you think double counting impacts your institution?

Step-by-Step Process

Step 1:

Step 2:

Step 3:

Step 4:

Your Challenges	**Your Suggestions**
1.	1.
2.	2.
3.	3.

Other Comments/Input:

Your Name:

Your Institution:

Topic: Capital Projects

Key Questions

The HERD survey instructions specify that R&D does not include "capital projects (i.e., construction or renovation of research facilities)".

a. How does your institution define and identify capital projects?
b. What steps are taken to make sure those expenditures are excluded from the HERD survey?
c. Have you had, in recent years, capital projects that would be classified as R&D?
d. Are capital projects funded by both internal and external funding? Is tracking of those expenditures different?

Response to Key Questions

Your Challenges	**Your Suggestions**
1.	1.
2.	2.
3.	3.

Other Comments/Input:

Your Name:

Your Affiliation:

Topic: R&D Personnel/FTEs

Key Questions

On Question 15 of the FY 2018 HERD survey we asked for a headcount of principal investigators and other personnel paid from the R&D salaries, wages, and fringe benefits reported in Question 12.

a. How were these values determined for FY 2018?
b. How do you identify PIs versus 'other personnel'?
c. Does the process differ for salaries paid from external funding versus internal funding?
d. How would that process change if you were asked for full-time equivalents (FTEs)?
e. How difficult would it be to report FTEs compared to the current practice of reporting headcounts?
f. How confident would you be in the accuracy of this reporting?

Response to Key Questions

Your Challenges	**Your Suggestions**
1.	1.
2.	2.
3.	3.

Other Comments/Input:

APPENDIX D: Capital Expenditure Sample Questions

Capital Expenditures Sample Question 1

Question X. Of your capital expenditures for R&D in FY 20XX, how much was spent for each of the following categories?

	R&D expenditures (Dollars in thousands)
a. Land Land acquired for R&D use, including land purchased for building construction.	$_____
b. Buildings Buildings constructed or purchased for R&D use. If the building is constructed or purchased for mixed use, please report the estimated proportion of the cost that is for R&D.	$_____
c. Machinery and equipment Major (capitalized) machinery and equipment acquired for use in the performance of R&D.	$_____
d. Capitalized software Computer software that is used in the performance of R&D for more than one year. Include long-term licenses and the acquisition of computer software, as well as production costs for internally produced software.	$_____
e. Other intellectual property products Purchased patents, long-term licenses, or other intangible assets used in R&D and which are in use for more than one year.	$_____
f. Total[1]	$ TOTAL

[1] The column total is automatically generated on the Web survey.

Capital Expenditures Sample Question 2

Question X. **What were your FY 20XX capital expenditures for R&D in the fields below? Please report federally funded expenditures in column (1) and all other expenditures in column (2).**

R&D Fields	Capital R&D expenditures (Dollars in thousands) (1) Federal	(2) Nonfederal	(3) Total[1]
A. Computer and Information Sciences	$ _____	$ _____	$ TOTAL
B. Engineering	$ _____	$ _____	$ TOTAL
C. Geosciences, Atmospheric Sciences, and Ocean Sciences	$ _____	$ _____	$ TOTAL
D. Life Sciences	$ _____	$ _____	$ TOTAL
E. Mathematics and Statistics	$ _____	$ _____	$ TOTAL
F. Physical Sciences	$ _____	$ _____	$ TOTAL
G. Psychology	$ _____	$ _____	$ TOTAL
H. Social Sciences	$ _____	$ _____	$ TOTAL
I. Other Sciences	$ _____	$ _____	$ TOTAL
J. Non-S&E Fields	$ _____	$ _____	$ TOTAL
K. Total for All Fields of R&D[1]	$ TOTAL	$ TOTAL	$ TOTAL

[1] Row and column totals are automatically generated on the Web survey.