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IT Support for Research Grant Activity in Higher Education: Pursuing Integrated Electronic Research Life-Cycle Systems

Peter J. Murray, University of Maryland, Baltimore



Increased demand for the eroding federal funds that sustain the research and careers of higher education investigators as well as institutional core businesses has resulted in fierce competition for funding. This demand has also placed increased pressure on both research institutions and the federal government to effectively manage research grant proposal activity. Federal agencies and universities have struggled with effectively processing and managing large numbers of proposals, voluminous grant information, and financial transactions that are distributed across many research entities and user communities. The government and higher education institutions alike have been trying to effectively translate formerly paper-based processes into electronic processes in order to more efficiently manage this activity.

A federal mandate to submit all federally sponsored proposals in electronic form has been issued. On November 20, 1999, President Clinton signed into law the Federal Financial Assistance Management Improvement Act. Two of the requirements of this law are to improve the effectiveness and performance of federal grant programs, and to simplify grant application and reporting requirements. The Administration was committed to making it easier for organizations to apply for and report progress on federal grants (Office of Management and Budget, n.d.).

With the new mandate, the transition from paper-based to electronic processes must occur for both the federal government and higher education institutions. This requirement has escalated the urgency in federal agencies as well as in higher education institutions to automate the grants process. The new requirement has initiated actions to build systems and create electronic mechanisms for preparing and submitting proposals, as well as for award notification and processing of awards. The Grants.gov portal was created by the federal government as a resource and unified site for finding grant opportunities and applying for federal grants online. The requirement has transformed the federal grant proposal system through its use of an electronic application process. The National Institutes of Health (NIH), as one federal agency example, responded to the mandate with the Electronic Research Administration (eRA) initiative. It is the NIH infrastructure that supports Grants.gov in the electronic submission of grant applications. NIH is transitioning to support electronic submission through Grants.gov one research program or funding mechanism at a time, with support of all mechanisms currently targeted for October 2007 (NIH Office of Extramural Research, 2007).

For higher education institutions, the need is for a university-wide Web-based system that provides rapid and reliable access to program and funding information, along with the capability for faculty and administrators to electronically route proposals through an approval process and submit proposals electronically. The system also should provide administrative staff with the tools to more efficiently process grant applications, submit proposals electronically to the federal government, and perform the functions of post-award grants management and grants accounting.

The purpose of this bulletin is to identify external and internal factors that highlight the growing importance of IT support for research grant activity in higher education. These factors are driving higher education institutions to develop integrated electronic research life-cycle systems.

Highlights of IT Support for Research Grant Activity

Breton and Osterhage (2005, p. 1) have described sponsored research grants and contracts administration as comprising two distinctly different but related functions: the pre-award functions and the post-award functions. They indicate that the pre-award functions primarily include “non-financial issues, such as the grant proposal creation and submission process (including budget preparation), award notice and acceptance, compliance issues having to do with use of human subjects, animals, homeland security and a growing list of other federal requirements, negotiation of contract terms and conditions, interfacing with federal and other granting and contracting agencies, and the creation and maintenance of a comprehensive grants and contracts database.” The post-award functions include the “financial administration of award expenditures, compliance with financial and related contract or grant terms and conditions, creation and maintenance of an expenditure database that is either compatible with or part of the institution’s financial accounting system.” A financial accounting system is typically integrated or interfaced with the pre-award proposal and award database so that reports can be generated to address financial audit and any other data needs regarding proposals, awards, or expenditures under sponsored research grants and contracts (for example, to assist in developing indirect cost proposal submissions).

Unfortunately, there is a very limited number of vendor-developed software packages that have effectively integrated these two functions. The integrated software packages that serve both pre- and post-award functions have typically had stronger and better functionality for post-award accounting, since most of these enterprise resource planning (ERP) software solutions were initially created for the private sector. The pre-award functionality, which is more unique to higher education, has primarily been supported by niche software solutions. Apparently, the market for this software functionality has not been great enough for many large ERP providers to spend substantial research and development funds for either developing or continually enhancing the pre-award product. As a consequence, higher education institutions have either had to select and implement one of the few vendor products that integrated these functions or purchase best-of-breed software and build interfaces between them.

The lack of vendor software available to effectively support the integration of these two functions is prominently highlighted by the new federal mandate, as well as by the need to be more efficient in the preparation and submission of proposals and in the management of award expenditures. The notion that these functions can operate without electronic integration and still be supported by manual processes or software that doesn’t facilitate the integration of electronic processes is unrealistic today.

Translating Paper Processes to Electronic Processes

The federal government mandate to submit all federally sponsored proposals in electronic form has led to additional complexities in the support of research grant activity in higher education institutions.

Electronic submission per se is familiar to many faculty and institutions, since electronic person-to-system submission processes (e.g., Fastlane and PureEdge) have been used for several years. As Lloyd (2006, p. 1) indicates, “in the PureEdge system, the [principal investigators] PIs download the forms from Grants.gov to their local hard drives, fill them out, add attachments, then send them to the Office of Research, where they are corrected, if necessary.” Lloyd states that in many institutions “the PIs fill out and print a local data form, collect the approval signatures on it, and bring it to Research, where the proposal gets final approval and is submitted electronically.”

It is apparent that the federal interface (PureEdge forms) to Grants.gov will not meet the future needs of research universities to effectively and efficiently create proposals online, electronically route and approve proposals using system security and workflow rules, and submit them electronically to the federal government and other major sponsors. PureEdge forms are typically completed through the use of locally stored information on the PI’s computer, and each proposal requires a reentry of personal data. PureEdge forms were not designed to provide institutions with a data repository for reporting, nor for interfacing with an enterprise human resources and financial system. In the transition to a system-to-system interface between an institution and Grants.gov, some institutions may consider using PureEdge forms temporarily and populating parts of the forms with information residing in university enterprise systems.

Lloyd (2006) explains that the move to system-to-system submission, which Grants.gov recommends if an institution submits more than 100 proposals per year, will necessitate some real changes in institutional business practices and require considerable training for faculty and staff. Functional and technical resources will be required to integrate personnel, departmental, and sponsor information from existing databases into the new system-to-system environment. Functional “power users” or “champions” within departments will be required to determine proposal routing business rules to be integrated into the pre-award system’s electronic routing engine. These resources are likely also to assist with the training effort as the system is rolled out to larger and more disparate populations.

Lloyd (2006) contends that PIs will have to learn how to prepare and submit proposals in a new system; departmental and research office staff will have to learn how to perform electronic routing and approval; and the back-office infrastructure will need to be in place before the system can work effectively. Lloyd also explains that during this period of transition, institutions as well as faculty may have to work with three systems for preparing and submitting proposals: (1) an existing paper system and the associated back-office systems that may be currently in place to log the submission of paper proposals; (2) the PureEdge forms and the associated back-office systems currently in place; and, (3) the system-to-system interface, which may or may not require the use of

separate back-office systems. Lloyd notes that another consideration is the fact that many grants are not federal and thus will not go through Grants.gov at all.

Whatever temporary and stopgap measure institutions are using for the short-term, Lloyd (2006) asserts that research universities will eventually need and want to develop and use a system-to-system interface with Grants.gov. A PI will develop proposals in a university system and have them routed and approved electronically within this system, and then they will be submitted to Grants.gov. The proposal preparation functionality, electronic routing and approvals, automated entry in a university-wide system, establishing a data repository, and interfacing with a financials and post-award system are critical parts of a fully electronic cycle of pre-award grants processing. The difficulty is finding the right system solution that will meet these requirements and be an integral component in a comprehensive electronic grant life-cycle system.

As research universities seek the right system solution, the selection decision will ultimately lead to a vendor or consortium system, rather than developing a homegrown system. Lloyd (2006) indicates that there are more than 100 forms under development at Grants.gov. Trying to keep a homegrown system and the forms in sync and up-to-date is more than any one university will want to do on its own. A vendor or consortium solution, he argues, would do the work of incorporating these forms into a system for use by multiple universities.

The problem, however, is that there is a lack of vendor and consortium options and solutions. There are vendor- and consortium-developed (and supported) systems for pre-award functions and for post-award functions, but there are only a few integrated systems available to institutions that provide the integrated pre- and post-award system functions.

The lack of integrated system solutions is becoming more of an issue with new federal laws and rules for the electronic submission and processing of grant proposals; the need for better reporting and information for compliance purposes, indirect cost recovery negotiations, research effort, grants budgets and expenditures, and proposal acceptance rates; and the reconciliation of proposals and awards activity. There is a need to rapidly evolve and make the transition to fully electronic and integrated systems to meet external and internal demands.

The Impact and Approach at the University of Maryland, Baltimore

The University of Maryland, Baltimore (UMB) is one of the many institutions dealing with the challenge of being prepared to submit grants electronically through the Grants.gov interface while pursuing an integrated enterprise pre- and post-award research system.

In March 2006, UMB implemented PeopleSoft financials and post-award management modules. The pre-award software functions in PeopleSoft were not implemented. As such, it was not a system for the electronic routing and approval of proposals, but it served as a solid foundation for that next phase and provided researchers, research administrators, and central office staff with an improved grants management system.

The pre-award research information system is the next phase in a sequence of projects to build a state-of-the-art system that integrates human resources, financials, and pre- and post-award research. A research steering committee and working group committee discussed and defined project vision and scope, system-critical success factors, research processes, and roles and responsibilities, and it evaluated several possible pre-award software systems. These systems were Coeus, PeopleSoft, InfoEd, and ERA software Grants Application Management System (GAMS).

Coeus was the product selected by UMB.

Coeus is an Electronic Research Administration system developed by the Massachusetts Institute of Technology (MIT) and named after the Greek Titan of Intelligence. Created to assist the research community in proposal development and pre- and post-award management, the purpose of the system is to standardize, and increase the efficiency of award acquisition and administration for all participants contributing to the research enterprise. With the introduction of its comprehensive proposal development module, Coeus was one of the first cradle-to-grave award management systems in the nation. The software makes it possible to prepare proposals, route them to obtain internal approvals, and submit them to sponsors electronically. The robust award module stores detailed information on awards, reporting requirements, terms and conditions, as well as the required approvals for the award. (Coeus Consortium, 2007, para. 2)

“Given the Coeus track record over the past 11 years, it is no wonder that when Grants.gov was ready to create the system-to-system interface, they chose MIT and Coeus as their sole partner in developing that interface” (Coeus Consortium, 2007, para. 4).

The future development of Coeus will include contributions and participation from institutional members of The Coeus Consortium and the Kualii Foundation. “The Kualii Foundation is a nonprofit organization responsible for sustaining and evolving a comprehensive suite of administrative software that meets the needs of all Carnegie Class institutions. Its members are colleges, universities, commercial firms and interested organizations that share a common vision of open, modular, and distributed systems for their software requirements. The goal of Kualii is to bring the proven functionality of legacy applications to the ease and universality of online services” (Kualii Foundation, 2006a, para. 1). The Kualii Research Administration (KRA) project “will update the Coeus technical architecture for vendor independence and easier integration with other administration systems and will offer expanded research administration functionality as its next community source software for higher education” (Kualii Foundation, 2006b, para. 6).

Coeus, when fully implemented at UMB, will reduce redundant data entry into internal as well as federal and other systems. It will serve as the repository for information collected through electronic proposal routing; track proposals as they move through the review and approval process; record information about awards as they are received; and interface and share data with PeopleSoft financials and post-award grants. A key

integration point will be the use of a new user-friendly and powerful Web reporting tool that will provide access to proposal, award, and financial data in these systems. In addition, and very importantly, Coeus has a system-to-system interface with Grants.gov.

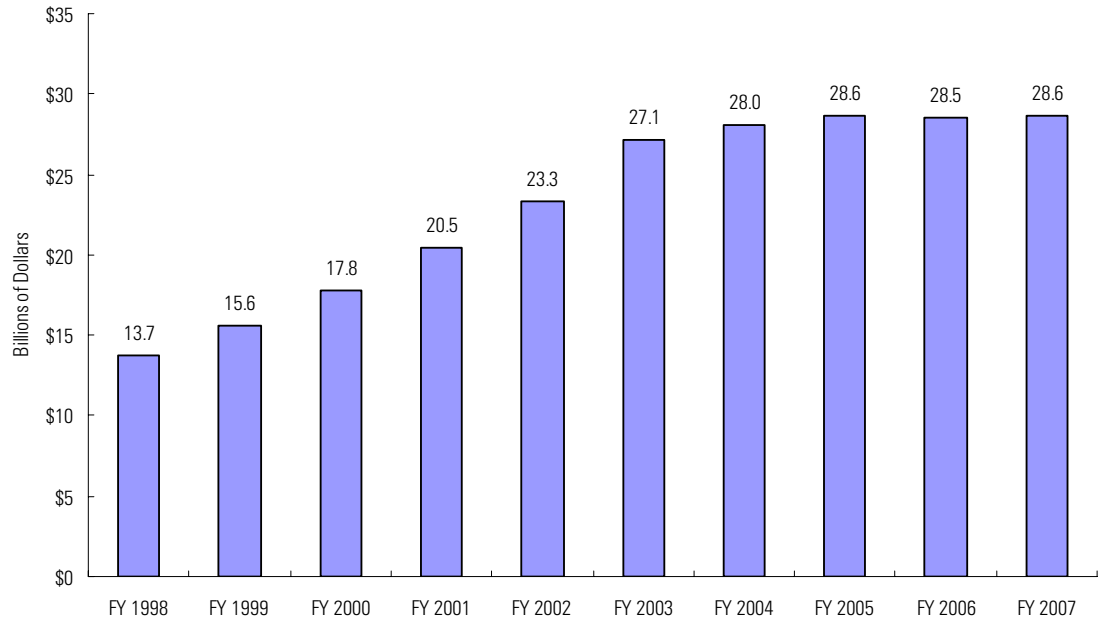
Phase 1 of the UMB Coeus Project was initially implemented for four pilot departments that prepared real proposals in Coeus. The proposals were submitted electronically to Grants.gov in February and March 2007. Phase 2 of the Coeus Project includes building and testing interfaces (for example, with the financials/post-award system); configuration of remaining workflow and route control; establishment of security roles; essential data conversions; and the enhancement of a common reporting tool for accessing proposals, awards, and financial expenditures. Phase 2 also includes the rollout of Coeus to faculty in all schools and departments at UMB.

Some of the key outcomes of the UMB Coeus Project include the ability of researchers to prepare grant proposals online, electronically route those proposals through an approval process with defined rules and process flow, and track proposals as they move through the electronic routing and approval pathway, and a faster overall approval process. The new system will assist faculty researchers who desire an easier administrative process of submitting proposals so that they can focus their time on the science, which will result in better proposals and a higher acceptance rate of proposals. The system will comply with federal rules for electronic submission of proposals to Grants.gov; assure that required data for campus and external reporting are captured; facilitate the data sharing, integrations, and electronic interfaces with PeopleSoft HRMS and financials and with other enterprise-wide systems, such as Effort Reporting and Space Management; and offer a fully developed reporting strategy for proposals, grants, and financials that provides users with one reporting tool for all of their data needs. This system will provide better and more data for decision making and for undertaking grant-related cost studies and analyses. It will be a system that simplifies and streamlines the research process. Furthermore, it will position UMB as a leading institution in the use of a system-to-system interface (Coeus) with Grants.gov to meet the federal mandate and the requirements for electronic grant submission. It also satisfies a university need and provides the remaining pieces for an integrated electronic research life-cycle system.

What It Means to Higher Education

Federal support for research conducted at universities and at university-administered research and development centers has slowed, after increasing 138 percent in real dollars between FY 1980 and FY 2003, including a 72 percent rise between 1990 and 2003 (Sonnenberg, 2004). Funding from two of the largest agencies involved in research, the U.S. Department of Health & Human Services (HHS) and the National Science Foundation (NSF), increased 139 percent and 66 percent respectively between 1990 and 2003 (Sonnenberg, 2004), but beginning in FY 2004, the tremendous growth ended and the funding leveled off (NIH, 2007; NSF, 2007). As illustrated in Figure 1, NIH congressional appropriations for research showed a doubling between 1998 and 2003 (Zerhouni, 2006), but between 2004 and 2007, the funding level has remained relatively constant (NIH, 2007).

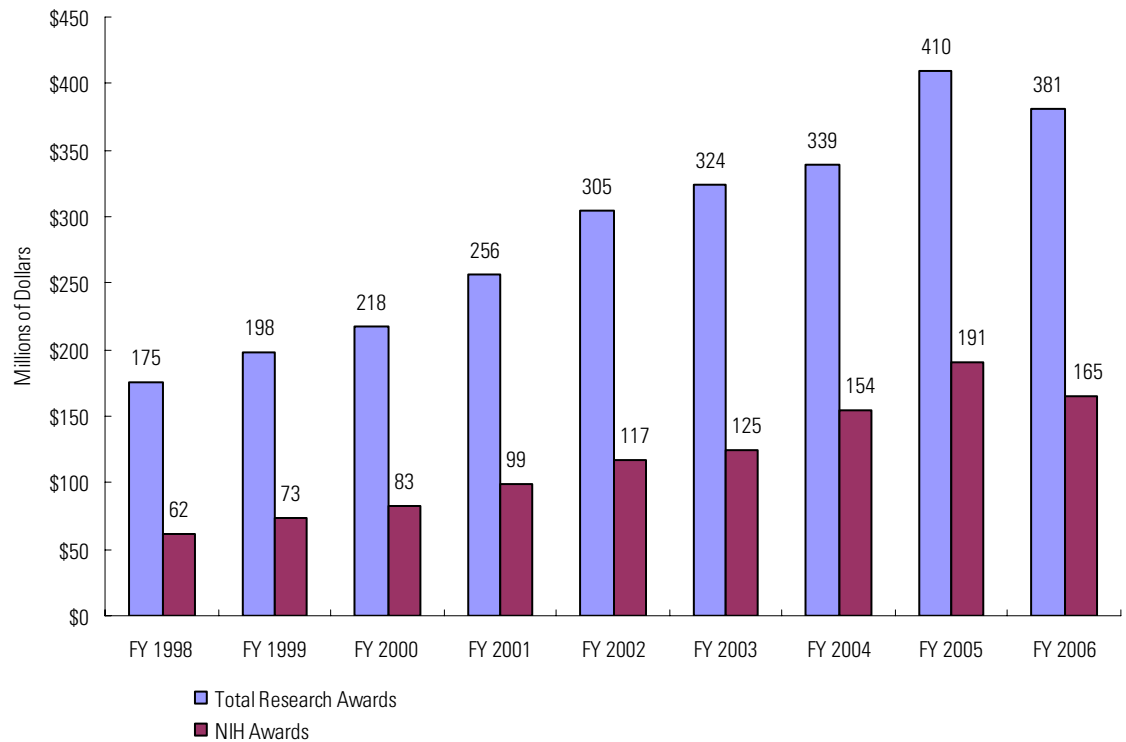
Figure 1. NIH Congressional Appropriations, Fiscal Years 1998–2007



Furthermore, the small gains in NIH funding from FY 2003 to FY 2007 have been eroded by inflation, with a 7.3 percent loss in purchasing power. Just as research universities were growing this core business and the demand for grants and grant funds were expanding, the funding available from the HHS plateaued in nominal dollars and actually decreased in real dollars. The impact is beginning to be felt in research universities because the success rates of new applications and new applicants being funded by NIH is declining (Zerhouni, 2006).

The growth in federal research funds prior to 2004 fueled the growth of grant applications, applicants, and funding at U.S. research institutions, including at UMB, where research awards not only followed the pattern of tremendous growth in research budgets at NIH and other federal agencies but actually exceeded it. In 2006, however, UMB, like many other research universities, began to feel the effects of the slowdown in the growth of federal funding for research and experienced a decrease in NIH and total research awards between 2005 and 2006 (see Figure 2).

Figure 2. University of Maryland, Baltimore, Research Awards 1998–2006



University of Maryland, Baltimore, Office of Research and Development, February 2007

The explosion of research at universities during the federal funding growth period raised the level of importance and significance of this activity in institutions. The growth in research activity in higher education has meant a greater number of grants, increased grant funds, more PIs, additional facilities and research space, larger support staff, and more sophisticated administrative operations. Research has grown to be a core business for many universities, including UMB, and has become even more critical to those universities that have experienced declines in revenue allocations from state governments. It has become an increasingly important element in the careers and salaries of faculty who are producing outcomes that are critical to the social, health, and human services of national and international communities.

The future of federal support for research is uncertain, and the eroding pool of available federal funds is a concern for institutions of higher education. During the funding growth period, institutions established research infrastructures that included new buildings, research facilities, researchers and support staff, equipment, and additional expenditures for expanded support operations. Research institutions need to at least sustain current levels of research activity in order to sustain the use of physical infrastructures and support operations. In addition, faculty are concerned about levels of federal funding for research because their livelihoods and careers depend on this support. Furthermore, breakthroughs in research may not occur if the competition becomes so severe that currently funded research projects are no longer supported.

In the face of this uncertainty of federal funding for research, universities are seeking to sustain and possibly grow research activity through the development and use of better systems and processes. The desire is for a system that will offer online proposal preparation, electronic routing, and a faster overall approval process. Easier preparation of proposals and a faster approval process are appealing to faculty as well as to senior administration, since the volume of proposals is only expected to increase. This would potentially mean additional proposals of a higher quality being generated and submitted to funding agencies. A higher volume, and even higher quality, may help sustain the research and careers of investigators as well as sustain an institutional core business.

Without better and more efficient processes for preparing, approving, and submitting grant proposals, research universities are to some extent at risk. Electronic solutions will mitigate that risk by strengthening support for research and reducing administrative inefficiencies. Electronic proposals are less error-prone than paper-based proposals. Proposal-preparation software performs validation against the contents of the proposal, which allows the PI or administrator to correct any error prior to submitting to the sponsor. This decreases the chance that a proposal will be rejected because of a mere technicality. Electronic routing and approval engines eliminate many of the mundane, time-consuming processes that have kept researchers out of the laboratories and doing what they do best—performing research activities. In the past, a paper proposal had to be packaged and sent via inter-office mail or, in the case of last-minute changes, walked across campus to be given to the next approver in the chain of needed approvals. Proposal creation, aggregation, and routing can be delegated to administrative resources, allowing the PI to concentrate on the content of the research proposal. Integrating proposal creation and routing tools with the back-office research and financial systems provides an institution with the capability to get a complete picture of how and where research dollars are being granted and denied. This allows for data-mining capabilities that assist an institution with making better decisions regarding when and where to submit proposals, and for which research initiatives.

A fully electronic research life-cycle system will help ensure compliance with federal regulations, which is becoming more extensive each year. It will also serve to equalize the variations of administrative support available to faculty throughout campuses and with federal agencies. A cohesive approach to proposal submission and pre-award data integrity will serve the research mission of the institution and meet the mandate of streamlining the grants processes required of federal agencies. This approach will provide for an institution-wide use of electronic routing systems that transfer proposals through an approval process, submission to the federal government, award notification, and integration with an enterprise pre-and post-award research and financial system.

The importance of IT support for research grant activity in higher education today cannot be overstated. In addition to complying with the federal mandate being imposed on institutions for the electronic submission of proposals, institutions must lessen the administrative burden for PIs and make it easier to prepare and submit proposals. There must be administrative efficiency in processing, collecting, submitting, and reporting pre- and post-award grants and financial data. Integrated electronic research life-cycle systems and processes that spur an increase in

proposals being submitted, as well as faster cycles for administrative processing, are needed in the fierce competition for limited research funds.

Key Questions to Ask

- What can higher education do to encourage adequate vendor investment in grant proposal and management software that will serve higher education now and into the future?
- What is the future of the Coeus product, as well as other pre-award products, as they evolve to meet federal requirements and institutional needs?
- What kind of impact will the Kualii Foundation and the KRA project have on Coeus as they become involved in the development of this product?
- What is our level of confidence that the federal government will be fully ready to accept electronic system-to-system proposal submission for all types of research programs and funding mechanisms in 2007? In what ways are we prepared, or not prepared, to comply with federal mandates in terms of faculty training, systems integration, and overall institutional readiness?
- How can our institutions be prepared to support new research requirements for the next three years? Five years? Ten years? What issues should we be tracking, and who is accountable for overall institutional coordination?

Where to Learn More

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About the Author

Peter J. Murray (pmurray@umaryland.edu) is Vice President and Chief Information Officer at the University of Maryland, Baltimore.

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