

HOWARD UNIVERSITY FACULTY WORKLOAD POLICY

January 21, 2000

Purpose: This university-wide Faculty Workload Policy has been developed to fulfill an essential component of the *Strategic Framework for Action*, which was adopted by Howard University's Board of Trustees on September 28, 1996. Fully cognizant of the fact that many academic units within the University have workload policies, there is need for a general policy that establishes the principles of consistency, equity, and flexibility together with a process for determining workload responsibilities that is uniform across the various schools and colleges. The activities, duties, and responsibilities of the faculty must be determined in relation to (1) the mission, objectives and strategic plans of the University, and (2) the specific mission, goals, and objectives of the respective departments across the various schools and colleges. The workload obligation of an individual faculty member should reflect the proportion of faculty effort within each of the three areas of responsibility¹ that best represents the interests and strengths of the faculty member, while simultaneously furthering the excellence of both the department's and the University's academic, research/scholarly, and service programs. This policy establishes a university-wide framework for each of the three workload categories, across which any individual faculty member's proportion of effort may vary. Additionally, this Faculty Workload Policy will provide a principled basis for the development of a policy that regulates performance evaluation of faculty contributions. Furthermore, the principles of this document are consistent with the policies contained in the *Faculty Handbook*.

Faculty Responsibilities: Appointment to the faculty of Howard University carries with it the responsibilities for excellence in teaching, the intellectual growth of students, high scholarship, and the improvement of society. In addition, faculty members have a responsibility to participate in the life and operation of the university and particularly the department and school or college of their appointment. Although the final authority for the conduct of university affairs is vested in the Board of Trustees, the academic judgements, recommendations, and policies of the faculty are central to the university's general educational policy and in determining the shape and character of the university as an educational institution.

The primary responsibility of full-time faculty is dedication to the educational, research and service (institutional and public) goals of Howard University. Faculty devote substantially all of their professional work time and effort to carrying out the duties and the responsibilities of their faculty appointments, with the exception of limited consulting and other outside activities of a professional nature. Outside professional activities should not be allowed to interfere with a faculty member's teaching, research, advising and University service obligations. In carrying out their academic and professional responsibilities, full-time faculty are expected to engage in the following: sustained

¹ The three areas are teaching, research, and service. The area of professional development is included as part of any or all of the three. For further explanation see the definitions and tables in the appendix.

excellence in teaching, the intellectual growth of students, high scholarship, and the improvement of society. Faculty members have a responsibility to participate in the life and operation of the university and particularly the department and school or college of their appointment. Faculty are expected to give their best efforts to a) engage in effective teaching, b) make scholarly contributions in research or creative works, c) render service to the university, the profession, and the community, and d) exhibit evidence of professional development in any of the other three areas.

In this policy, faculty workload is broadly conceived to refer to all faculty activities that are related to professional duties and responsibilities, and where faculty effort is distributed across three domains: instructional activities; research, scholarly and creative activities; and service activities. As a Research Level I University, it is essential that Howard University maintains, sustains and expands academic programs of excellence. To this end, the Board of Trustees' Academic Excellence Committee has identified, among several performance goals, the assurance that all Howard University students "will receive a superior undergraduate, graduate and professional education" and that they "will meet the highest standards of academic performance." This can only be accomplished by the active engagement of all full-time faculty in each of the areas of instruction, scholarly and creative activities, and service.

Applicability: This workload policy applies, in its entirety, to all full-time career-status, probationary and tenured faculty members of Howard University. Part-time and temporary faculty may be employed for limited duties, such as teaching specific courses, engaging in research, or supervising students in clinical/practicum settings, and thus are obligated to perform responsibilities only in those areas that are explicitly identified in a special employment agreement and/or the approved personnel appointment document.

Effective Date: This policy takes effect on July 1, 2000.

Definitions: Definitions of the key terms used in this policy are found in Appendix I.

WORKLOAD RESPONSIBILITIES GUIDELINES

Howard University is a comprehensive research institution, committed to excellence in the areas of teaching, research, and service. Thus, all full-time faculty have an obligation to pursue professional duties and responsibilities in each of the three primary domains of intellectual activity. Stated another way, the primary responsibilities of full-time faculty are imparting knowledge to others (teaching or instructional activities), creating new knowledge (research, scholarship and creative activities) and facilitating the execution of the first two responsibilities (service). The faculty workload refers to the effort made in the execution of these three responsibilities.

This policy establishes a university-wide framework for individual effort in each of the three-workload categories, across which any individual faculty member's proportion of effort may vary.² Within this context, the policy allows each college or school to establish minimal expectations for its entire faculty across the three domains of work responsibility, including professional development, while still granting sufficient flexibility to departments to allocate individual faculty work assignments in consideration of the priority accorded to departmental objectives. The percent of effort ranges for the three areas of responsibility are:

Instructional Duties—at least 40%;
Research, Scholarship and Creative Activities—at least 30%; and,
Service Duties—at least 10%.

While all Howard University faculty are expected to meet the responsibilities outlined above and earlier in this policy, outlined below are four patterns that describe the distribution of professional responsibilities, which is ordinarily expected of faculty. For the purposes of this discussion, and with the understanding that equivalencies need to be specified by the disciplines and departments for approval, courses are assumed to consist of lectures or seminars for three hours a week and are semester-long in duration. In addition, it is recognized that in certain disciplines instructional activities are not defined by semester hours, but rather by other parameters, e.g., contact hours, clinical rotations, research preceptorships, etc. In such cases, semester hour equivalencies should be defined by the faculty for determining appropriate faculty workload assignments in the context of standard practice within the discipline or profession.

1. Faculty participating in programs offering only undergraduate degrees or undergraduate instruction will teach at least 15 and at most 18 semester hours annually, and pursue professional growth through research, scholarly writing, advanced study, or original creative production appropriate to their disciplines, and engage in service. Faculty assigned the minimum teaching load are expected to have substantial participation in research, scholarly or creative activity, undergraduate research supervision, or honors program participation, etc.
2. Faculty participating in programs offering only undergraduate degrees and the Master's degree will teach at least 12 and at most 18 semester hours annually and

² *The length of the formal week is established at a minimum of 40 hours. Studies over many years consistently have shown that, irrespective of the type of institution, faculty spend over 40 hours per week on professional activities, and often exceed 50 hours per week. National data reported by the U.S. Department of Education (1991) indicate that the hours worked per week, as a function of institutional type, were as follows: public research, 57; private research, 56; public doctoral, 55; private doctoral, 53; public comprehensive, 52; private comprehensive, 51; liberal arts, 52; and public two-year, 47. U.S. Department of Education. 1991. Profiles of Faculty in Higher Education Institutions, 1988. Report No. NCES 91-389. Washington, D.C.: National Center for Education Statistics.*

pursue professional growth through research, scholarly writing, advanced study, or original creative production appropriate to their discipline. Further, it is assumed that faculty in these programs may be called upon to teach at both the undergraduate and graduate levels, and must have significant involvement in the training and supervision of Masters students, and engage in service.

3. Faculty participating in programs offering doctoral degrees will teach at least 9 and at most 15 semester hours annually. In this case, they are expected to teach undergraduate (where appropriate) and graduate courses and to be engaged in substantial research that results in significant scholarly products or artifacts in the field, or significantly involved in doctoral education supervision and the training of doctoral students, and engage in service.

4. Faculty participating in professional programs will teach at least 9 and at most 15 semester hours annually. They will teach undergraduate courses, as appropriate, in addition to other courses. Also, they are expected to engage in substantial research that results in significant scholarly products or artifacts in the field, as appropriate. Further, they must be significantly involved in the training and supervision of students for professional degrees, and engage in service.

In those instances where the minimum teaching load is not achieved, e.g., in the event of courses with low enrollment or courses that must be cancelled due to insufficient enrollment, faculty will be assigned other duties in the department or in the School or College (such as additional student advising/counseling, involvement in recruitment or retention initiatives, accreditation preparation, departmental service, etc.). These assignments will be made by the department chairperson, after consultation with the individual faculty member, depending upon the amount of instructional activities in which the faculty member is engaged.

Additionally, the chairperson, in consultation with the dean, and the approval of the Provost, may grant “released time” from teaching to faculty who have (1) significant externally-funded support, depending upon the award amount and the proportion of effort funded or (2) substantial administrative or service requirements³. In unusual circumstances, a faculty member, upon the recommendation of the department chairperson and the dean, may be permitted to teach a minimum of two courses annually, with the approval of the provost.

In determining teaching load, a single course with both an undergraduate and graduate course number, meeting or scheduled concurrently, will count as one preparation. Individual instruction credits (such as reading courses, independent study courses, thesis/dissertation supervision) may be considered by the chairperson in determining

³ In addition, faculty members may, with concurrence of the chair and the dean, teach in excess of the credits described herein and “bank” the overload hours for a comparable amount of released time at a later date. The expenditure of “banked” hours must occur within one calendar year.

whether a faculty member has a full workload, but the number of semester hours will not be assessed as equivalent to those of courses not involving one-on-one instruction.

In the assignment of workload, consideration should be given to the following possible types of instruction: team teaching; graduate instruction; activity classes; laboratory courses; clinical supervision; directed study; and distance learning. Consideration for adjustments in workload should be given to at least the following: preparation for substantive changes in instructional methods, including the incorporation of new instructional technology; unusually large class sizes, especially in the absence of teaching or research assistants or an inadequate number of assistants; research productivity demands; student teacher supervision; thesis/dissertation supervision load; supervision of fieldwork; clinical student supervision; or extraordinary service on a university-wide committee.

In the area of research and scholarly/creative activities, a minimum of 30% of faculty time will be devoted to this effort during each semester. This may vary, however, depending on the amount of research or scholarly involvement in which an individual faculty member is engaged, as well as the extent of participation in the supervision of thesis/dissertation research.

Faculty Availability—All faculty members are required to have scheduled office hours that permit reasonable access by both full- and part-time students, and which must be approved by the department chairperson. In addition, this policy requires that office hours are conspicuously posted and filed with the department chairperson and the dean.

Professional Development—The University requires all full-time probationary, tenured and career-status faculty to continue their professional development through research, scholarly writing, advanced study, or original creative production, as appropriate to their disciplines. The concept of professional development is reflected potentially in the activities of all three components of faculty work. Thus, this policy provides that in the case of an individual faculty member, the decision as to which of the three areas of faculty responsibility to credit a particular professional development activity will be determined in consultation with the department chairperson, and shall reflect the nature of the professional development activity.

Consulting—This policy acknowledges a faculty member's right to outside consultancies, as long as these outside activities do not detract from the faculty member's availability for usual academic duties or exceed in aggregate the equivalent of one day per week. The university requires written disclosure of all outside consulting activities and these activities may not be competitive with or adverse to the best interests of the university. In general, paid outside consultancies are not used to satisfy a faculty member's university responsibilities. However, in cases where such activities are determined, a priori, in conference with the Dean and Department Chair, to promote the objectives of the university, college/school or department, such activities may be used to

satisfy a component of faculty workload. Non-paid consulting that enhances the goals of the university, college/school or department may also be credited in assessing faculty workload.

As a means of fostering greater productivity in faculty research, *The Strategic Framework for Action (SFA)* calls for consideration of a compensation plan for augmentation of academic year faculty salaries⁴ with income from grants. Consistent with this provision of the *SFA*, in lieu of the equivalent of the “one day per week outside paid consultancy,” this workload policy will permit full-time faculty to obtain approval from the Provost, upon the recommendation of the Department Chair and the Dean, for the equivalent of one day per week additional compensation from externally-funded grant, contract and cooperative agreement awards accepted by the University.⁵ Faculty may not receive both additional compensation and credit for released time from teaching for the same externally funded activity unless the award provides sufficient funds to employ another faculty member to assume that portion of the teaching load. The terms and conditions of a faculty member’s additional compensation for research shall be set forth in a supplemental income agreement, and must be consistent with OMB Circular A-110 (Revised). Also, as with all faculty employees of the university, fringe benefits shall be computed on the basis of the base faculty salary only.

WORKLOAD MEASURES

The criteria and units that are identified in this section for the measurement of the instructional, research and scholarly/creative, and service workload categories are provided as examples of appropriate indicators and are not intended to be exhaustive. The departments and colleges/schools are expected to develop and recommend additional indicators for these three categories that are appropriate or unique to their disciplines. In addition, because professional development is embedded in each of these categories, and given the range and variability of professional development activities, both within and across disciplines, the departments are charged to identify and define metrics and indicators appropriate to the discipline for each of the three workload categories.

Criteria and units for measurement of instructional activity

The criteria for determining instructional activity include all activities directly related to teaching. The unit of measurement is time, which usually is quantified in clock hours. For example, among the indicators appropriately used are the following:

Number of hours in class (laboratory, clinic, studio);

⁴ Faculty holding nine-month appointments retain eligibility for three months of extramural support during the summer.

⁵ For faculty in the College of Medicine, the limitation on additional compensation from extramural sources is guided by the Board-Approved “Faculty Agreement Regarding Supplemental Income.”

Number of hours required for preparation;
Number of hours required for evaluation;
Number of hours devoted to student consultation;
Number of hours devoted to individual instruction/tutoring, thesis/dissertation
Advisement; and
Number of hours devoted to curriculum development.

Criteria and units for measurement of research and scholarly/creative activity

The criteria for determining “research activity” include all activities directly related to creative and scholarly endeavors. Examples of measurement and metrics include:

Number of productions (papers, books, grant proposals, grants funded, reviews, presentations, performances, exhibits);
Number of memberships on dissertation/thesis research committees;
Size (in \$) of research grants or contracts;
Numbers of research and/or training grant applications to funding agencies; and
Numbers of grants received.

(Quality Metrics)

Number of citations and references;
Number of peer-reviewed papers, presentations, performances, exhibits;
Number of awards, prizes, invited lectures or presentations;
Number of dissertation/thesis committees chaired;
Number of M.S./M.A. students trained/graduated in any given year; and
Number of Ph.D. students trained/graduated.

Criteria and units for measurement of University and Public service activity

University Service refers to university activities not related to instruction or research or professional development. The units of measurement will be number, quality, and time. Sample metrics include:

The number of department, school, or university committee memberships;
The number of department, school, or university committees chaired;
The time devoted to department, school, or university administration; and
The time devoted to service as advisor to student organizations.

Public Service refers to faculty activities outside of the university. The units of measurement include number, quality, and time. Examples of metrics include:

The number of community, state, or national organizational committees;
The number (and level) of offices/positions in professional organizations; and
The number (and level) of public offices.

IMPLEMENTATION

A. FRAMEWORK/CONTEXT FOR INDIVIDUAL WORKLOAD ASSIGNMENTS

Faculty work must be determined in relation to the mission, objectives and strategic plans of the University, as well as the mission, goals and objectives of the department and the school or college. The department's overall instructional or course assignments shall be consistent with department and student needs. The faculty of each department is responsible for developing, offering and sustaining curricula that support simultaneously the mission of the university, the mission of the college/school in which the department is based, meet the goals and objectives of the departmental discipline(s) and, where applicable, fulfill accreditation standards. It is a paramount responsibility of each core departmental faculty—probationary, tenured and career-status members—to ensure the delivery of the department's instructional program to its undergraduate majors and minors, its graduate degree candidates, and to undergraduate and graduate students from other university departments for whom its courses are requirements. Also, it is assumed that departments will take into account the level of student demand in making decisions about the degree of responsibilities for teaching, research, and service for each faculty member.

In addition, the University encourages interdisciplinary collaboration in instruction, research/scholarship and service, where appropriate. Therefore, it is expected that as part of the implementation process for this Workload Policy, the departments and other academic units will promote, recognize and reward both interdisciplinary and multidisciplinary collaboration and participation. Further, it is recognized that "the responsibility profile" (i.e., the total of faculty contributions in the areas of instruction, scholarship/research and service) of each collective departmental faculty will be influenced by differences in the tasks and cultures of the various disciplines.

Faculty assignments should embody the principles of consistency and flexibility. The University expects consistent high-quality performance from all faculty in the mutually supportive areas of instruction, research, scholarly and creative productivity, and service. Therefore, faculty assignments should not be designed to inhibit faculty members from contributing in all three areas over the terms of their employment. Appropriate effort should be extended to achieve flexibility in faculty assignments so that the changing needs of disciplines, departments and the University are recognized and so that, by giving faculty the latitude to explore academic and professional opportunities as they arise, faculty contributions to the University can be maximized.

B. PROCESS FOR WORKLOAD ASSIGNMENTS

The Role of the Faculty Member. The workload obligation of an individual faculty member should reflect the proportion of faculty effort within each of the three core areas of responsibility that best represents the interests and strengths of the faculty member, while simultaneously furthering the excellence of both the department's and the university's academic, research and scholarly, and service programs. This framework obviously must be applicable to individual departments and modified, as appropriate, to take into account a variety of elements such as practica, studios, clinics and laboratory sections, as well as to accommodate diverse learning technologies.

The proposed policy incorporates the principle that the workload obligation of an individual faculty member should be made clear to the faculty member and be consistent with the principles stated above. Following are the time periods when workload assignments shall be established for an individual full-time faculty member:

- At the time of negotiation of initial faculty appointment;
- At the time of each reappointment for a temporary faculty member;
- At the beginning of each probationary term for career-status or tenure-track faculty;
- At the time of award of tenure or career-status;
- Every two years following the award of tenure or career-status;
- Following the conclusion of sabbatical leave;
- At the time of promotion for tenured faculty; and
- At any other time when a departmental need arises.

Role of Department Chair: The Chair, in consultation with each individual faculty member who holds a probationary, career-status, or tenured appointment, determines the workload assignment distribution for each faculty member, including the assignment of teaching responsibilities. If the faculty member objects to the workload assignment, the faculty member may appeal to the Dean for relief. Responsibility for identification of the specific graduate students for whom an instructor will serve as the thesis/dissertation advisor is delegated to the faculty member. For each part-time and temporary faculty member, the Chair decides on the particular workload composition that is assigned.

Role of the Dean: In colleges/schools that are organized by departments, the Dean is typically not involved in individual faculty workload assignments. However, when an individual faculty member objects to the workload assignment, the Dean shall review the case and render a final decision concerning the workload assignment. The Dean is also authorized to approve the recommendations of the Chair concerning "released time" for individual faculty. In cases where a faculty member is scheduled to offer courses in the Graduate School of Arts and Sciences or is a member of several thesis/dissertation committees, the Dean should consult with the Dean of the Graduate School of Arts and Sciences. In colleges/schools that are not organized by departments, the Dean determines

the workload assignment for each faculty member. Additionally, all requests for exceptions to the general university-wide workload policy must be reviewed by the Dean, who, in turn, generates a recommendation for consideration by the Provost, whose decisions regarding exceptions are final.

This policy provides the Dean with the appropriate authority to resolve any issues of concern to the faculty member. However, the Chair's proposed assignment of workload will stand during the process of review by the Dean, and the Dean will have the authority to make an adjustment in the schedule. The Dean will provide a fair review of the matters of concern to the faculty member, will allow the faculty member the opportunity to express his/her concerns, and will act expeditiously to resolve the matters of concern.

Formalization of Workload Assignment: The workload assignment of each individual faculty member should be formalized in a memorandum from the Chair to the individual, with copies to the Departmental Executive Committee and the Dean.

FEEDBACK AND REVIEW

Faculty workload and faculty assessment and evaluation are clearly related, but appropriately are covered under separate policies. The faculty workload policy addresses the kind and amount of work to be undertaken by faculty during a particular period, while a faculty assessment and evaluation policy addresses the quality of work provided by the faculty during a given cycle. The faculty workload policy provides the formal process under which all faculty will understand and participate in formulation of the individualized responsibility distribution for which they are accountable for a specific period and against which their performance will be assessed. The Department Chair will review with each full-time faculty member, on an annual academic year basis, that individual's progress and status with respect to fulfillment and performance of the assigned workload. Performance measured against the approved workload shall be considered in merit salary adjustment recommendations, promotion or tenure evaluations, and periodic performance evaluations.

REVIEW OF WORKLOAD ASSIGNMENTS BY THE DEAN

The Dean is responsible for ensuring that workload agreements are developed for all faculty in a timely manner and at the appropriate times, and that these individual agreements are appropriately documented and filed. The Dean exercises oversight to ensure that the collective, approved workload agreements within the college/school result in a distribution of effort among faculty members that promotes the efficient and timely completion of programs of study by students and facilitates compliance with accreditation requirements. Additionally, the Dean reviews and approves the workload implementation policies and procedures of the departments.

ROLE OF THE PROVOST

The Provost shall exercise the authority needed to ensure the fair and equitable implementation of workload policies throughout the Colleges and Schools of the University. The Provost approves all exceptions to the University-wide workload policy, and is the final arbiter for all matters pertaining to and arising out of the workload policy.

Appendix A

Proposed Faculty Workload Policy

DEFINITIONS AND KEY TERMS

This section provides a set of definitions for the key terms used in this policy.

Instruction includes teaching and preparation; preparing and revising syllabi; advising, supervising, mentoring and counseling students; assessing student outcomes; thesis and/or dissertation supervising and advising; supervising clinical, practicum, internship or student teaching experiences; preparing and grading assignments and examinations; assessing learning outcomes; review of current literature and research in the subject area, including instructional methodology; and developing curricula and courses.

Teaching involves the totality of the structured academic experiences and activities that provide opportunities for faculty to present, impart, and critique knowledge in an attempt to advance understanding and competence in a field of study.

Scholarly and/or Creative Activity (Research) refers to activity aimed at producing scholarly works, such as books, papers, paintings, plays, musical compositions, recitals, designs, exhibitions, or computer artifacts; creating new knowledge by scientific experimentation or applied/field research; supervising of research staff; developing proposals and applications for funding; preparing progress and final reports for extramural funders; rehearsing for dance, drama, or music performance; and discussing research with colleagues in formal venues such as conferences and symposia. Involves the totality of structured academic experiences and activities whereby faculty design and/or implement data gathering projects whose primary purpose is the production of new information, knowledge and skills that strengthen the scientific base and/or expand the potential contribution/application of a specific field of study.

Service involves the totality of structured experiences and activities that provide opportunities for faculty to share their talents and expertise with professional and nonprofessional communities locally, nationally, and globally. It is acknowledged that the many and varied communities constituting our world have different needs, and that these respective communities often seek the kind of assistance and expertise [i.e., service], which faculty members are uniquely prepared to provide. Service, therefore, is viewed as the sum total of activities that faculty members render to varied communities, whose expressed needs encompass the solicited expertise or competencies that individual faculty members command.

Institutional Service refers to a broad range of activities, including membership on departmental, college/school, divisional or university-wide committees; attendance at and

participation in departmental and college/school faculty meetings; working collaboratively and productively with faculty, administration and staff colleagues; leadership and committee responsibilities in the Faculty Senate; attendance at commencement and both regular and special university convocations; co-curricular activity advisement; participation in registration and other student services; as well as general administration responsibilities at the department or college/school level.

Public Service includes activities that usually occur outside of the university, e.g., service to the community, local, state or federal government, foundations; ones professional disciplinary organizations, etc. Typically, this is work where either a faculty member's professional expertise in her/his academic discipline or knowledge and competence acquired as a member of the higher education community is utilized to address societal needs for the benefit of the public and the wider community. It may also include activities not directly related to professional competencies; however, it must be related to the institutional mission to be counted in this domain.

Professional Development refers to time devoted to activities that contribute to the professional knowledge of the faculty member. It includes the reviewing of material related to one's discipline or profession; attending professional meetings, symposia and conventions; and completing continuing education courses and professional seminars that enhance one's disciplinary expertise and improve one's instructional or research competence and student advisement/counseling capability.

Released Time refers to the reduction of a faculty member's normal assigned duties (usually teaching load) in order to allow that faculty member to allocate additional effort towards some other area(s) of faculty responsibility. Refers also to instances where a faculty member is able to "buy out" some proportion of teaching responsibility because money is available from an extramural grant/contract that will support employment of an alternate instructor.

Semester refers to the approximately 18 week periods beginning in late August and ending in late December (first or fall semester); and beginning in early January and ending in mid-May (second or spring semester). For some of the university's 12-month professional programs, the first semester begins in July and extends until December, while the second semester runs from early January through late June.

Summer Sessions refers to the approximately 6-week instructional sessions occurring from mid-May until the first week in August.

Academic Year refers to the 9-month period beginning each year on or about August 16th and ending on approximately the 15th day of the following May.

Contact Hour refers to the time spent in classroom instruction (or laboratory or studio instruction); for example, a class which meets from 9:10am – 10:00am MWF would constitute three contact hours.

Semester Hour refers to the number of credits accorded to a unit of instruction, with one credit usually representing approximately 14 hours per semester of classroom instruction.

Laboratory Hour refers to the time devoted to instruction in a laboratory, clinic or field-placement setting.

Work Week refers to a minimum period of 40 hours devoted to responsibilities in the areas of instruction (knowledge transmission), research and scholarship (knowledge generation) and service (knowledge application).