

## **2006-115: LEVERAGING INFORMATION TECHNOLOGY TO ENHANCE THE MANAGEMENT OF GRADUATE EDUCATION PROGRAMS**

### **Wayne Whiteman, Georgia Institute of Technology**

Wayne E. Whiteman is a Senior Academic Professional and Director of the Office of Student Services in the Woodruff School of Mechanical Engineering at the Georgia Institute of Technology. He received his BS degree from the United States Military Academy in 1979, a master's degree from MIT in 1987, and a Ph.D. in Mechanical Engineering from Georgia Tech in 1996. Whiteman is a retired Colonel in the U.S. Army and completed 24 years of active military service. He served on the West Point faculty from 1987 to 1990, and 1998 to 2003.

# **Leveraging Information Technology to Enhance the Management of Graduate Education Programs**

## **Abstract**

Properly managing graduate engineering programs can significantly enhance the educational experience of graduate students and help ensure that they are able to focus on their academic studies. This paper offers improvements to graduate program processes that leverage information technology and enhance the graduate scholarly experience. Two major areas of enhancements are presented. The first area is in the recruitment and admission processing of graduate students. Administering graduate student financial aid is the second area. The efficiency and effectiveness of these enhanced services are documented. The Structured Query Language (SQL) was used to build a relational database to implement these improvements. Similar procedures could easily be incorporated for use at other educational institutions.

## **Introduction**

Despite advancements in the area of information technology, improved automation tools have not always been fully leveraged to improve the management of processes, even at educational institutions. This paper offers two specific ways of leveraging information technology to improve graduate program processes and enhance the graduate education experience. When we help students and faculty manage these processes, the students can dedicate more time and focus toward academic studies and the overall educational experience.

Two areas of improvement to graduate student processes are offered in this paper. The first is in the area of recruitment and admission. The second involves the processing of graduate student financial support. The enhancements provided by implementation of these services are documented and reported. The Structured Query Language (SQL) was used to build a relational database and implement these improvements.<sup>1</sup> Similar procedures could easily be incorporated for use at other educational institutions.

This work was motivated by the management of the graduate student program in the Woodruff School of Mechanical Engineering at the Georgia Institute of Technology. The Woodruff School has a current enrollment of approximately 700 graduate students and receives nearly 1000 applications a year. Prior to the implementation of the practices described in this study, the processes used to manage these graduate programs were almost entirely paper-based. Some data was kept electronically, but this data was manually entered by clerical personnel and was subject to numerous errors. The procedures offered in this paper enhance the efficiency and the effectiveness of the academic and student services provided to graduate students along with their faculty advisors. This new system also improves accuracy and contributes positively to the overall academic experience.

## Recruitment and Admissions Processing of Graduate Students

As with most academic institutions, the recruiting and admissions of graduate students at Georgia Tech is done at the program, or department, level. By automating this process, applicant files are viewable by both the administration and the faculty within 24 hours of an applicant applying to the program. Graduate student applications at Georgia Tech are completely done online. Rather than having clerical personnel re-entering this data, applicant information is immediately transferred into an SQL database. This information includes previous school information and GPAs, letters of recommendation, standardized test scores, research area interests, and personal biography information, to include narrative responses pertaining to goals and interests, along with published works, honors, and work experience.

Figure 1 shows the graphical interface available to administrative and support staff personnel responsible for the graduate student recruitment/admissions processing. Information provided in this figure is self-explanatory.

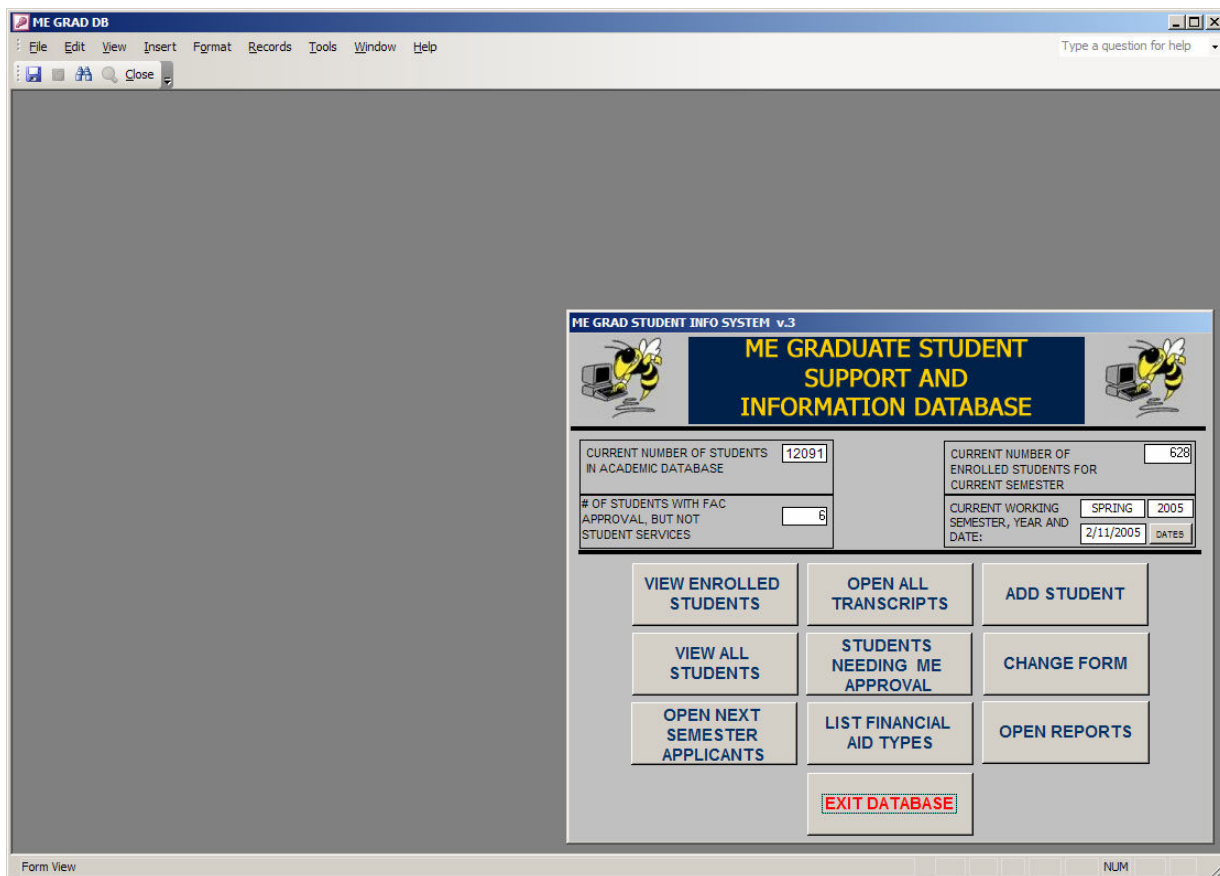


Figure 1. Information Database Graphical Interface

Figures 2 through 5 show the data available on each student in the program.

ME GRAD STUDENT DATABASE

Exit Export... Unhide... Type a question for help

STU\_MAINFORM

**VIEWING ALL STUDENTS** COUNT: 12065

TO APPLICATION INFO TO REFERENCE LETTERS TO SEMESTER SUPPORT TO TOP OF FORM TO DEGREE INFO TO NEW AWARDS

NAME George P Burdell GTID 900012540 PRISMID gtgeopb

**PERSONAL INFORMATION**

DOB	AGE	GENDER	ETHNICITY	USCIT	GA RESIDENT	COUNTY	VISA #	VISA	CAMP	EMAIL (click to email)	ENROLL	ENTRYTERM
6/23/1901	104	F	W	A	NO				ATL	george.burdell@me.gatech.edu	N	
CURRENT ADDRESS 1		CURRENT ADDRESS 2				CURRENT CITY	CURRENT ST	CURRENT ZIP	COUNTRY	PHONE		
Undergraduate Admission		219 Uncle Heine Way				Atlanta	GA	30332-0320		404-8940483		
PERM INMATE ADDRESS		PERM ADDRESS 2				PERM CITY	PERM STATE	PERM ZIP	PERM COUNTRY	PERM PHONE		
2020 Bobo St						Alphabet	AL	11011				
OFFICE	OFFICEPH	MEMAILBX		STUDENT NOTES								
BLDG	LABPH	GTMAILBX										

**ADVISORS**

ADVISOR 1	EMAIL	ADD / EDIT ADVISORS
ADVISOR 2	EMAIL	

**SEMESTER SUPPORT INFORMATION**

SUBMIT DATE	STUDENT COMMENT	FACULTY COMMENT	OSS APPROVAL	RAISE REQUEST	SPECIAL CIRCUMSTAN.
			No		
SEMESTER			OSS APPROVAL DATE		
SEMYEAR			FACULTY APPROVAL	No	
WAIVER ?	No		FAC APPROVAL DATE		
WAIVER PRIORITY			FINANCE APPROVAL	No	
			FIN APPROVAL DATE		

**GRANTED AID INFORMATION**

SEMESTER	YEAR	TYPE	SUBTYPE	SOURCE	ACCOUNT	AMOUNT	FREQUENCY	TIME	REMARK

NEXT SEMESTER PRINT SUPPORT ADD SUPPORT PREVIOUS SEMESTER

PREVIOUS RECORD MOVE BACK 5 FIND BY LNAME FIND BY PRISMID FIND BY GTID NEXT RECORD MOVE AHEAD 5 EXIT CLOSE

Form View

Figure 2. Student Information – Personal Information and Financial Support

Figure 2 is a screen shot of basic data and personal information for each applicant, along with current and past students, in the program. This includes contact information, demographics, enrollment status, and faculty advisor. The financial semester support section will be discussed later in this paper. The academic records of each student are shown in Figure 3. Academic major, degree level, and master's degree and/or Ph.D. data is stored here. Academic test scores and previous school and degree data are also kept in this portion of the database. Figure 4 contains admissions processing information. It includes the applicant's narrative input to the application process, along with information on the application decision. The remainder of applicant information shown in Figure 5 includes awards, honors, publications, and letters of recommendation.

ME GRAD STUDENT DATABASE

VIEWING ALL STUDENTS COUNT: 12065

TO APPLICATION INFO TO REFERENCE LETTERS TO SEMESTER SUPPORT TO TOP OF FORM TO DEGREE INFO TO NEW AWARDS

NAME George P Burdell GTID 900012540 PRISMID gtgeopb

### DEGREE & SCHOOL STATUS

ENROLLED N MAJOR BIOE LEVEL 12 GTDEG AREA DEPT ME GTOPA 1st PhD TERM

EXP GRAD SEMESTER EXP GRAD YEAR

#### MASTERS INFO

MISNT: MIS DATE: MIS POS: MIS TOPIC:

MIS THESIS TITLE: MIS THESIS ABSTRACT:

#### PHD INFO

PHD PHDDATE PHD POS: PHD PROPOSAL PHD PROP DATE: QUALS STAT: QUALS DATE:

PHD THESIS TITLE: PHD THESIS ABSTRACT:

#### GRE / TOEFL INFORMATION

GRE: 700 GREQ: 750 GREV: 650 GREW: 5.5 TOEFL: 300 DATE: 2/5/2004 SOURCE: SCRP

#### PREVIOUS SCHOOL INFORMATION

SCHOOL 1:	Georgia Inst of Technology	SCHOOL 2:	
SCHOOL 1 DEGREE:		SCHOOL 2 DEGREE:	
SCHOOL 1 MAJOR:		SCHOOL 2 MAJOR:	
SCHOOL 1 GPA:		SCHOOL 2 GPA:	

PREVIOUS RECORD MOVE BACK 5 FIND BY LNAME FIND BY PRISMID FIND BY GTID NEXT RECORD MOVE AHEAD 5 EXIT CLOSE

Calculating ...

Figure 3. Student Information – Academic Records

ME GRAD STUDENT DATABASE

VIEWING ALL STUDENTS COUNT: 12065

TO APPLICATION INFO TO REFERENCE LETTERS TO SEMESTER SUPPORT TO TOP OF FORM TO DEGREE INFO TO NEW AWARDS

NAME George P Burdell GTID 900012540 PRISMID gtgeopb

### POST APPLICATION AWARDS, HONORS PUBLICATIONS

TYPE	NAME	PLACE	DATE	NOTES

#### APPLICATION INFORMATION:

APPDATE	ME STATUS	DECISION	DECISION CODE	DECISION DATE	AREA OF RESEARCH 1	AREA OF RESEARCH 2
12/2/2004						

#### APPLICATION FINANCIAL AID INFORMATION

AID	RATE	FEES	PF	GTL	TRAVEL	WOODRUFF	DESIGATED OFFER:

#### APPLICATION NARRATIVES:

STATED CAREER OBJECTIVE: EXTRA CURRICULAR ACTIVITIES

ELABORATE ON YOUR OBJECTIVE GOALS

PERSONAL INTERESTS WHY SHOULD GT CONSIDER YOU?

PREVIOUS RECORD MOVE BACK 5 FIND BY LNAME FIND BY PRISMID FIND BY GTID NEXT RECORD MOVE AHEAD 5 EXIT CLOSE

Form View

Figure 4. Student Information – Application Information

The screenshot displays the 'ME GRAD STUDENT DATABASE' application window. At the top, the title bar reads 'ME GRAD STUDENT DATABASE'. Below it is a menu bar with 'Exit', 'Export...', and 'Unhide...'. A toolbar with various icons is visible. The main window title is 'STU\_MAINFORM'. The current view is 'VIEWING ALL STUDENTS' with a 'COUNT: 12065' indicator. Navigation tabs include 'TO APPLICATION INFO', 'TO REFERENCE LETTERS', 'TO SEMESTER SUPPORT', 'TO TOP OF FORM', 'TO DEGREE INFO', and 'TO NEW AWARDS'. Search fields are present for 'NAME' (George), 'P', 'Burdell', 'GTID' (900012540), and 'PRISMID' (gtgeopb). The 'APPLICATION PUBLICATIONS & HONORS' section contains two columns of fields: '1 PUBLICATION TITLE:', '1 PUBLISHED IN:', '1 HONORS 1', '1 EMPLOYER 1:', '1 JOB TITLE:' on the left; and '2 PUBIN2', '2 PUBS2', '2 HONORS 2', '2 EMPLOYER 2:', '2 JOB TITLE:' on the right. Below this is the 'LETTERS OF REFERENCE' section with columns for 'REFERENCE NAME:', 'INSTITUTION:', 'TITLE:', and 'DEPT:'. At the bottom, a control bar features buttons for 'PREVIOUS RECORD', 'MOVE BACK 5', 'FIND BY LNAME', 'FIND BY PRISMID', 'FIND BY GTID', 'NEXT RECORD', 'MOVE AHEAD 5', and 'EXIT CLOSE'. The status bar at the very bottom indicates 'Form View'.

Figure 5. Student Information – Publications, Honors, and Letters of Reference

Much of the information contained in Figures 2 through 5 is helpful to administrative and support staff personnel in administering recruitment and admission processing. Faculty members also need admissions information to search for graduate students for whom they would like to serve as faculty advisor. Prior to the implementation of this automated system, faculty members were required to physically view paper files in the Office of Student Services. With the new system, all graduate student application information is available through a web interface. This information includes student name and contact information, admissions status, research area interests, previous school(s), degree(s), GPA and test scores, work history, narrative application responses, published works, honors, and letters of recommendation. Faculty members are able to search and sort on this data to efficiently find graduate students who would best fit into their research groups. Figure 6 shows the web interface faculty members use to acquire this data. All of the fields listed are searchable and may be sorted upon.

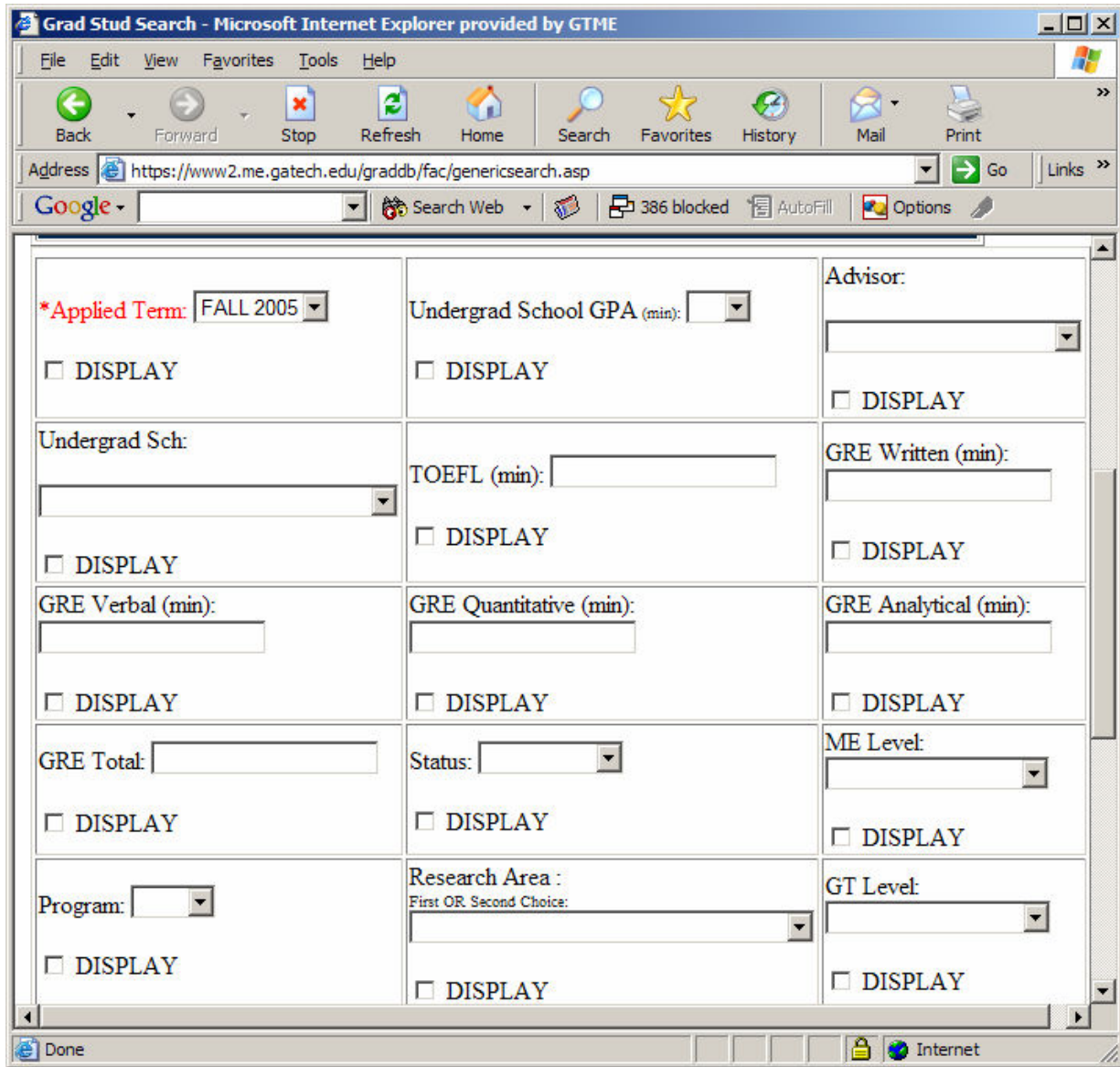


Figure 6. Faculty Web Interface for Searching Applicant Information

### Automation of the Financial Support System

The Office of Student Services and the Finance Office of the Woodruff School of Mechanical Engineering at Georgia Tech administer financial aid to qualified graduate students in the form of Graduate Research Assistantships (GRA), Graduate Teaching Assistantships (GTA), Fellowships, and Out-of-State Tuition Waivers.

Prior to the current automated system, this entire process was paper-based. Students were required to submit paper forms to their faculty advisors for approval, who in turn submitted the forms to the Office of Student Services and the Finance Office for processing. The new procedures have completely automated this process. The financial support forms are now submitted electronically and are maintained in the SQL relational database.

Earlier in the paper, Figure 2 was a screenshot that showed the final financial support data stored

**ME STUDENT SEMESTER SUPPORT FORM - Microsoft Internet Explorer provided by GTME**

Address: <https://www2.me.gatech.edu/graddb/stu/sform.asp>

**RAISE REQUEST:**

If a raise is being requested, please write a short (less than 200 characters) justification.  
 If student is not working 1/3 time for the entire semester, give the effective dates of employment and fraction of full time.  
 (Greater than 1/3 time support must be approved by Dr. Joshi.)

**SUPPORT INFORMATION:**

**PLEASE INCLUDE ALL TYPES AND SOURCES OF SUPPORT**

> INCLUDE SUPPORT FROM OTHER DEPARTMENTS OR OUTSIDE SOURCES  
 > CHOOSE TYPE - 'NO SUPPORT' IF SUPPORT IS NOT AVAILABLE FOR YOU

TYPE	SUBTYPE	SOURCE	ACCOUNT #	TIME	STIPEND TYPE	STIPEND AMOUNT
Select Type	Select SubType			Select Time	Select Stipend	
Select Type	Select SubType			Select Time	Select Stipend	
Select Type	Select SubType			Select Time	Select Stipend	
Select Type	Select SubType			Select Time	Select Stipend	

**PRIOR SUPPORT :**

**YOUR LAST 4 APPROVED SUPPORT SUBMISSIONS WERE:**

TYPE	SUBTYPE	SOURCE	ACCOUNT #	TIME	STIPEND TYPE	STIPEND AMOUNT
ASSISTANTSHIP	GRA	FGF	E3433	0.333	SEMESTER	450
ASSISTANTSHIP	GRA	GBG	e432	0.333	SEMESTER	786
FELLOWSHIP	GE	JLL	E4488	0.333	MONTHLY	450
ASSISTANTSHIP	DOD	GFG	E3434	0.333	ANNUAL	450

**FORM SUBMIT:**

**COMMENTS:**  
 If you have any comments that you wish to convey to the ME Graduate Office, please enter them in the space to the right (less than 200 characters please).

\* PLEASE SELECT THE SEMESTER & YEAR FOR SUPPORT: SEMESTER YEAR

\* NOTE: THE MAJORITY OF STUDENTS SHOULD BE SELECTING SPRING SEMESTER 2005!

THIS FORM IS FOR UPCOMING SEMESTERS ONLY! \*

PLEASE ENTER YOUR EXPECTED GRADUATION TERM & YEAR: GRAD SEMESTER GRAD YEAR

\* PLEASE ENTER YOUR ADVISORS' EMAIL ADDRESS: SELECT ADVISORS EMAIL

IN LEIU OF SIGNATURE, SELECT THE MONTH YOU WERE BORN: JAN

SUBMISSION DATE: February 11, 2005

\* ITEMS MARKED WITH AN ASTERISK ARE REQUIRED \*

SUBMIT RESET

The form has been verified to work with Internet Explorer 5.5 & 6. It has been known to work using Mozilla Firebird 0.7 for Windows and Mozilla 1.4 for Linux. If you experience problems, use Internet Explorer.

Figure 7. Student Web Interface for Financial Support Information



for use by administrative and support staff personnel. To acquire this information, students log in for security purposes and electronically submit information each semester through a web interface shown in Figure 7. This information is then forwarded to the faculty advisor who adds appropriate financial accounting information and approves the request. Final approval and processing for appropriate payment is completed by the Office of Student Services in conjunction with the Finance Office.

Figure 8 shows a screenshot of the graphical interface for faculty members to review and approve their graduate students' financial support. An added benefit of this feature is that faculty members are able to see the history of their support for any particular student for all previous semesters. Faculty members are also able to view all the students that they have financially supported, sorted by previous semester.

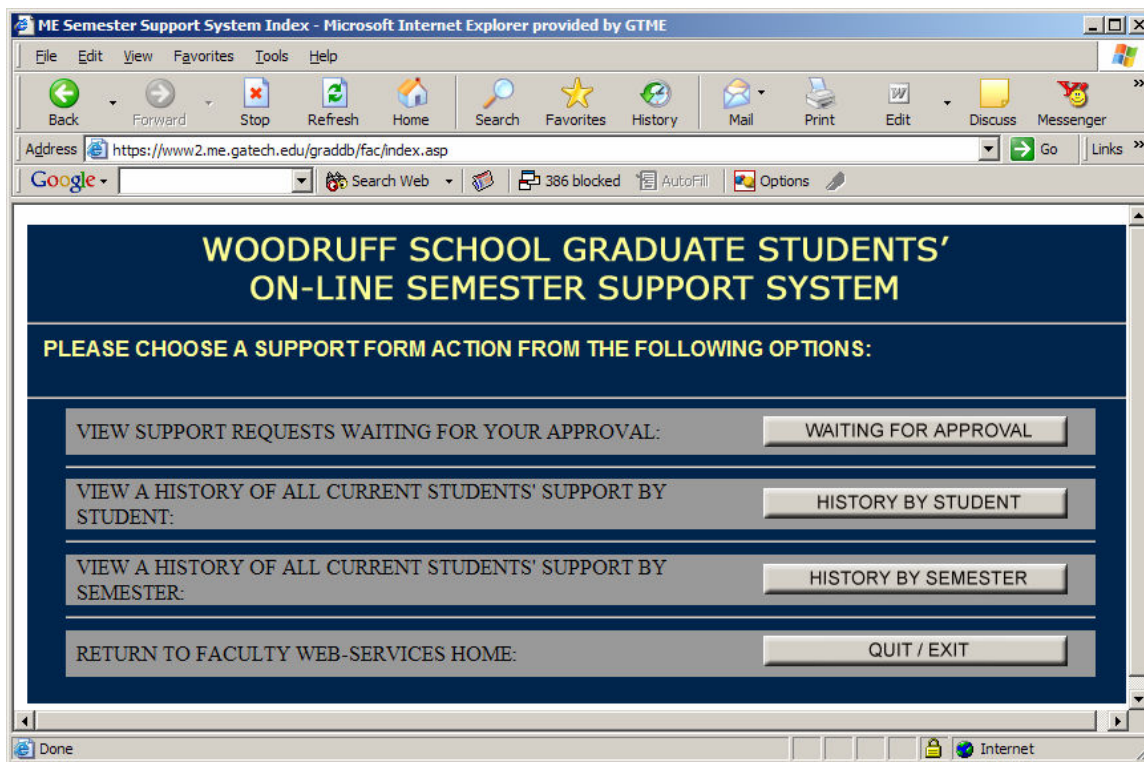


Figure 8. Faculty Web Interface for Financial Support Approval

## Results

This new system has had a measurable impact on approximately 700 graduate students per semester, nearly 100 faculty members, and approximately ten administrative personnel who are involved in graduate student recruitment and admission, and the processing of graduate student financial aid requests.

The recruitment and admission portion of the new automated system has reduced paperwork and the time required by the School administration and faculty members to recruit and admit graduate students. Each year, the Woodruff School receives nearly 1000 graduate student

applications. Because of the ease of viewing and working with this application data electronically, this process has reduced processing time by 50%, resulting in significant resource savings every academic year. Under the old paper-based system, individual faculty members needed to physically come to the Office of Student Services to review and recruit potential graduate students by looking at their paper files, requiring a substantial amount of time. By allowing faculty members to now view this information online, this time is saved and there is also the added advantage of the individual faculty member's ability to sort applicants by specified criteria (e.g. minimum GPA, test scores, research area, etc.) to determine the most desirable graduate student candidates.

This financial automation portion of the new system has reduced paperwork and the time required by graduate students, faculty advisors, and student service and finance personnel to process support forms. Each semester approximately 300 graduate students and 75 faculty members are involved in the financial support form submission process. Because of the ease of submission, and the fact that previous submission data is now available to easily view, it is estimated that this process has reduced processing time by 50% for students and faculty in submitting this data. In processing the data each semester, personnel from the Office of Student Services and the Finance Office of the Woodruff School are required to take action on these submissions and ensure that graduate students are properly paid. Under the old paper-based system, this process took nearly 12 hours per semester. The new automated system has reduced this time by half, again resulting in significant resource savings per academic year.

As an added benefit, the administration of the Woodruff School must submit annual reports and several other reports throughout the academic year. Many of these reports request information concerning graduate student admissions, and data and statistics on the financial support of graduate students. Prior to the current automated system this data had to be culled from paper forms, resulting in countless hours and marginal accuracy of report submissions. Figure 9 shows a list of standard reports available in the system. Customized reports can be generated by choosing the option to "build your own query." This results in a comprehensive database for ease of tracking and an accurate historical record, along with a savings to administrative personnel required to assemble this report data.

## **Conclusions**

This automation project was completed as an "in-house" project by the Computer Support Group of the Woodruff School of Mechanical Engineering in collaboration with the Office of Student Services and the Finance Office. The initial, one-time cost was substantial but is estimated to be recouped by cost savings during the second year the system is in place. Routine maintenance and upgrading is completed by the Computer Help Desk personnel in the Woodruff School with minimal costs.

The new automated system has reduced the amount of paperwork and inefficient services that were being provided to the graduate students, faculty, and staff of the Woodruff School. Prior to implementation of the new practices, data had to be manipulated manually resulting in marginal accuracy and more time than was necessary in processing administrative matters.

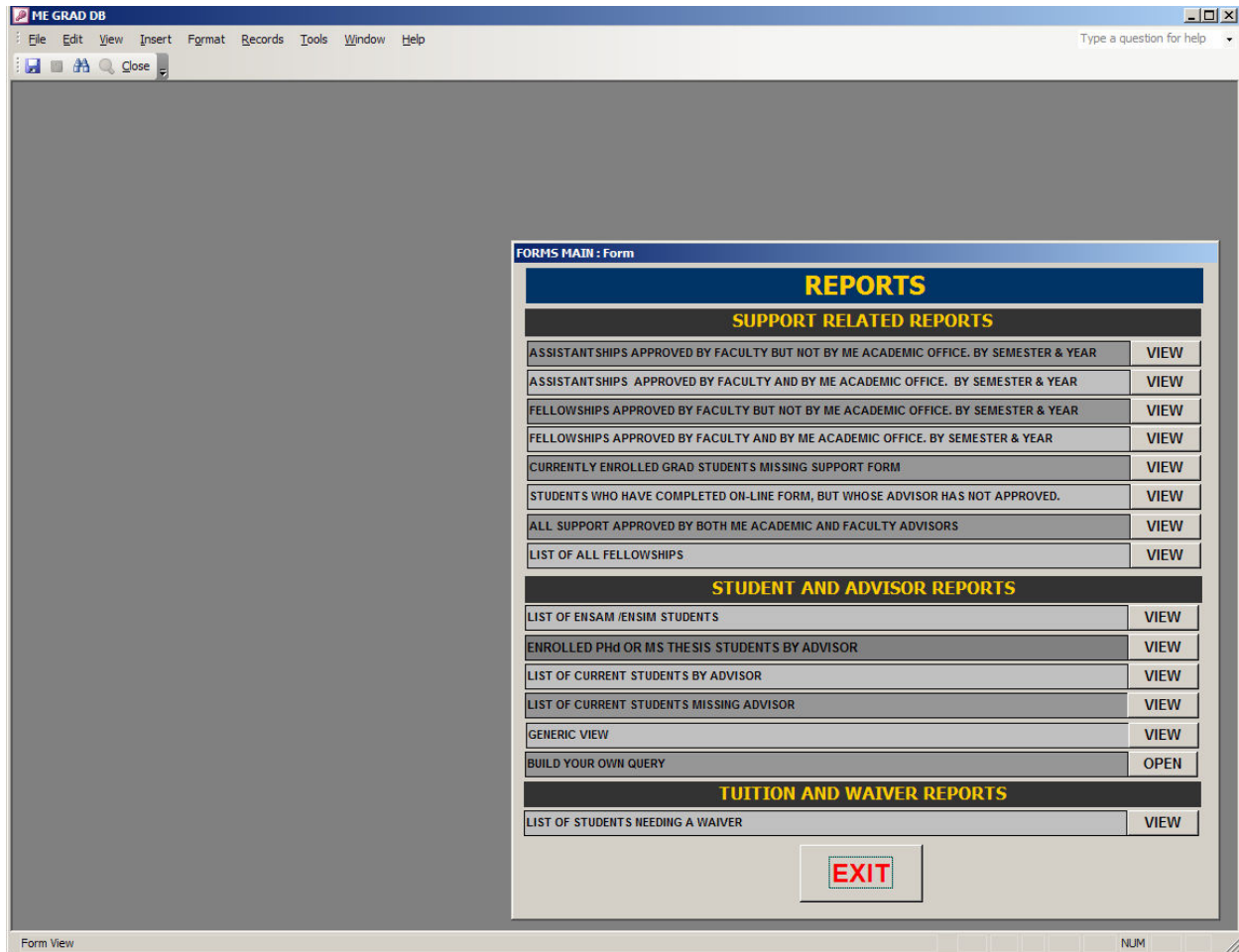


Figure 9. Automated Reports

By leveraging information technology, the management of graduate education programs can be significantly enhanced as outlined in this paper. This enhances the educational experience of graduate students, offers significant savings to faculty involved in these processes, and allows students and faculty to place more focus on academic studies. The automated systems described in this paper may be easily modified and implemented for use at other educational institutions.

### Acknowledgements

The author would like to acknowledge the following staff members of the Woodruff School of Mechanical Engineering at Georgia Tech; Bill Miller, Jefforey Murphy, John McCullough, Ken Dollar, Phil Coulson, Trudy Allen, and Glenda Johnson. Their support and hard work in implementing this automation project is deeply appreciated.

### Bibliography

<sup>1</sup> Kline, Kevin, Daniel Kline, and Brand Hunt, *SQL In a Nutshell, 2<sup>nd</sup> Edition*, O'Reilly & Associates, Inc., 2004.