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Louis C. Attinasi Jr.

Robert H. Fenske

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Micro and Mainframe Computer Models for Improved Planning in Awarding Financial Aid to Disadvantaged Students

by
Louis C. Attinasi, Jr.
and
Robert H. Fenske

This article reports the development of two computer models, one mainframe the other microcomputer, which are intended to maximize financial aid awards to disadvantaged students. The models recognize the tendency of students from low-income and minority backgrounds to apply for assistance late in the funding cycle, and permit institutional aid administrators to project the amount of aid needed by such students and to plan for an adequate inventory of funds to accommodate their needs.

A major obstacle to the equitable distribution of student financial aid appears to be the failure of many economically disadvantaged students, for whom such aid is particularly targeted, to apply in a timely fashion for assistance. Much of the blame for this problem has been credited to the complexity and rigid deadlines of the application processes for federal and state aid programs (College Board, 1981). These are particularly troublesome for low income and minority applicants and their families.

A frontal attack on this problem would involve a revamping of aid distribution mechanisms at the state and federal levels so that students and their families face simpler, better coordinated application procedures. Short of this, individual institutions of higher education might consider the employment of projective planning techniques that could, without sacrificing efficiency in the award process, extend the period of time within the institution's financial aid cycle when funds were available for specifically targeted students.

This article describes how the latter approach was implemented at one institution of higher education through the development of a mainframe computer model that enables institutional aid administrators to set financial aid policy — packaging formulae and eligibility levels — so as to provide a level of service that is at the same time maximally equitable and maximally efficient. This is possible because the model permits administrators to project the funds needed by targeted disadvantaged applicants and to plan for an adequate inventory of funds to accommodate their needs during each funding cycle. The paper also describes the development of a microcomputer model for use by small insitutions with limited mainframe capability which achieves much the same results (Fenske & Voohees, 1983).

Louis C. Attinasi, Jr., is Assistant Professor of Educational Leadership and Cultural Studies at the University of Houston. Robert H. Fenske is Professor of Higher Education at Arizona State University.

Rationale

Recently, Hearn and Wilford (1985) reviewed the effects of federal student financial aid on access, college choice and persistence. Their overall conclusion was not as pessimistic as that of Hansen (1982) who found essentially no equalization of enrollment opportunity effects attributable to Title IV Programs, nor as optimistic as that of Griffith (1985) who concluded that the student aid programs have had a significant, positive impact on educational attainments, especially for poor and minority students. Hearn and Wilford developed a procedure to disaggregate effects and found that student aid has had a marked influence on the access and persistence of economically disadvantaged students. Still these researchers agree with other scholars (Astin, 1982; Fenske, 1983; Lee, 1985; Stampen, 1985) that, while some progress has been made, achievement of equal educational opportunity across socio-economic levels remains an elusive goal. The observation of a College Board (1981) survey team a few years ago remains true:

> Billions of federal, state and institutional funds have been spent during the past decade to remove financial barriers facing individuals seeking a college education. Yet young people from low-income families are still less than half as likely to enroll in college as their counterparts from high-income families. (p. 12)

Colleges and universities generally are intensely interested in serving disadvantaged students. Donors of aid funds often also express this aim as their motivation for providing the funds. Assisting disadvantaged students is the implicit goal of federal financial aid programs (Green, 1982). Economically disadvantaged students are often educationally and socially disadvantaged as well, and they are overrepresented in ethnic and minority populations (Miller & Hexter, 1985).

At the same time that institutions strive to serve disadvantaged students, they also wish to operate their aid programs as efficiently as possible in the interest of achieving effectiveness and promoting equity. A "first come, first served" policy of processing applications and awarding funds is both effective and equitable *only* if all potential applicants have similar capabilities to cope successfully with such obstacles as rigid deadlines and complex forms. Students from economically disadvantaged backgrounds often apply late to their institutions for financial assistance, or submit incomplete or incorrect application forms. As institutionally-controlled aid tends to be disbursed early in the funding cycle, it may be depleted by the time these especially needy students complete the application process. The College Board report cited above also stated that a disproportionately high number of low-income and minority students fail to cope successfully with application complexity and deadlines, and concluded that: "Delays or late filing can effectively preclude a student from receiving aid (especially scholarships and grants) since many states and institutions cannot assist all eligible students, and stop making awards when funds run out" (p. 15). Clearly, if institutions are to achieve an equitable distribution of the student aid funds they control, they must take account of the problems faced by the financially disadvantaged in making timely application for such assistance. The computer models described in this paper illustrate one approach to taking account of those problems in the award process.

Setting

The setting for this project was Arizona State University in the Phoenix Metropolitan area, an urban, graduate-level institution of over 40,000 which is experiencing a rapid rate of growth. Among the student body is a significant (and increasing) number of low-income and minority aid applicants.

Arizona State University awards student financial aid in eighteen-month cycles.

The Office of Student Financial Assistance begins accepting applications on January 1 of each year and continues to accept them until May 1. Awards may be determined anytime between April 15 and the beginning of Fall classes, but the majority are made by mid- to late-June. Applicants not receiving aid in the initial round of awards may subsequently be assisted, but only if unobligated balances occur in the individual fund programs following completion of the first round. Clearly, this system of awarding assistance favors students who apply early in the aid cycle. However, economically disadvantaged students often apply late or submit incomplete or incorrect application forms.

Creating a Comprehensive Data Base

The development and implementation of the mainframe computer model for improving decision-making in awarding financial aid to disadvantaged students occurred in two steps. First, the project researchers created a comprehensive, longitudinal data base of past financial aid results at Arizona State University and performed analyses with the data base in order to ascertain the existing pattern of student aid distribution, including the pattern of assistance to disadvantaged students. With the information generated by these analyses in hand, staff in the Office of Administrative Computer Services designed and tested a mainframe computer program with the capacity to project, on a continuing basis throughout the funding cycle, the level of need of targeted disadvantaged students for aid funds.

The comprehensive financial aid data base included data for the 1980-81 and the 1981-82 financial aid cycles. For each cycle, a data base file was created by merging four source files: two external files containing need information, provided by the American College Testing Program and by the College Scholarship Service; the Arizona State University Financial Aid Master file which contains student financial aid applications and award information; and an extract of the Arizona State University Student Data Base which contains student demographic and academic information. For each cycle, the source files were merged into a single master file. From the master file, a second file containing 237 variables was extracted. The extracted files were analyzed to ascertain the existing pattern of student financial aid distribution at Arizona State University.

Profiling Late Aid Applicants

A number of statistical analyses, involving frequency distributions, measures of central tendency, and cross-tabulations, of variables in the extracted master files were conducted. Most informative were the analyses of award denial rates and the reasons for award denials, characteristics of late aid applicants, and the types and amounts of aid packaged for late aid applicants at Arizona State University.

Students initially denied aid because of late application may subsequently receive financial aid. The assistance they receive may be extra-institutional (e.g., Pell Grants, Guaranteed Student Loans) and/or campus-based aid, such as College Work-Study, National Direct Student Loans or institutional programs such as athletic and academic scholarships. Financial aid officers are obligated to process applications for Pell Grants and the Guaranteed Student Loan program at practically any time during an academic year. Moreover, unobligated balances may occur in any of the campus-based programs and, when this becomes apparent to financial aid personnel, students who were formerly denied aid from these programs can be assisted.

To develop the historical, empirical basis for the planning models described in the following sections, the researchers delineated "profiles" of late applicants (including those whose applications, although submitted before deadlines, contained

errors and/or omissions that delayed their processing). For example, during the 1980-81 award year, 3,755 students did not meet the May 21st deadline for filing applications. In contrast, 14,621 students did meet the deadline, successfully coped with the application process, and were subsequently awarded aid. In terms of sex, residency, class and state resident/non-resident status, the late applicants were not significantly different either from successful applicants or from the general student population. However, they exhibited significantly higher levels of financial need and lower levels of individual and family financial resources available to meet college costs.

Interestingly, minority groups were *not* overrepresented among these economically disadvantaged late applicants. In fact, it was white students who were overrepresented. The researchers noted that this imbalance was probably due to two factors. First, in Arizona most severely economically disadvantaged students from minority backgrounds attend the very numerous community college and proprietary school campuses rather than one of the three public senior university campuses like Arizona State. For example, during the 1983-84 academic year, only 8.2 percent of the public university enrollments were minority students (Native American, Black or Hispanic) compared with 20.6 percent in the community colleges and 19.8 percent in the proprietary schools (Erbschloe & Fenske, 1984). Low-income students tend to select these options because of much lower costs compared to the public university. Tuition and fees are extremely low in the community colleges, and while tuition is often quite substantial in the proprietary schools, the overall projected cost is low because the programs are typically short-term and counted in weeks and months rather than the four years required for the baccalaureate degrees offered by the universities.

Second, very effective programs have long been in place to specifically assist low-income minority students cope with college admission and financial aid application procedures. These are the so-called TRIO programs (Talent Search, Upward Bound, and Special Services for Disadvantaged Students) and the Educational Opportunity Centers (Franklin, 1980, 1985), and while they have been extraordinarily effective in serving minority students on the Arizona State University campus, they have apparently been underutilized by white economically disadvantaged students.

Developing the Mainframe Computer Model

In addition to the profiles of the late aid applicants, analysis of the comprehensive data base yielded a time-related set of probabilities for forecasting actual dates when specified subpopulations of disadvantaged students could be expected to apply for financial aid. This information was furnished to staff in Arizona State University's Office of Administrative Computer Services, who, in collaboration with the project researchers and the Office of Student Financial Assistance, designed a mainframe computer model for optimizing financial assistance to disadvantaged students at Arizona State University. The model, called the Financial Aid Computerized Tracking System (FACTS), is a sophiscated packaging system for the distribution of campus-based aid at Arizona State University. Written in COBOL, FACTS bears a similarity to commercially available packaging software such as the Packaging Aid Resources System, a packaging module developed by the College Scholarship Service, but contains additional features which provide for more complete automation of the packaging and re-packaging process. Built into the program are the capacities to track students and fund balances and to project fund balances. Furthermore, the program can be run in simulation in order to evaluate particular funding formulae. FACTS was field-tested during 1982 and is currently operational at Arizona State University.

Description of FACTS

FACTS runs on three input files: (1) a package fund file, (2) a package group file, and (3) a package student file. The *package fund file* contains information about each fund from which awards can be made, for example, the National Direct Student Loan program fund or the Supplementary Educational Opportunity Grant program fund. Fund data include award limits for each academic term, various codes which control fund usage, eligibility criteria, and running balances for both fund monies and number of awards.

Packaging instructions for designated categories of students are located in the package group file. The criteria for assigning students to categories are flexible and the composition of the categories may vary from one term to the next. For instance, a student who is full-time in the Fall and part-time in the Spring might be assigned to a different category for each term. Group packaging instructions include selection criteria, award limits in terms of need and/or absolute amounts established by the aid office, and a list of the funds from which awards are to be made, including their fund and award limits. Three award limits may be used, need and two others, so that limits for grants, self-help, scholarships, etc., may be set separately.

The third input file required to run FACTS is the *package student file*. This file contains student demographic information which is used to determine group membership and fund eligibility, other data used during the awarding process, and information about each term in the award year which the student plans to attend. Term information includes all of the data that is variable by term and all of the awards previously made to the applicants.

As operational at Arizona State University, FACTS produces COBOL-driven output files that are written either to a disk or to a tape which provides a record of the transaction that the program has produced. For example, the output files are used to print reports of packaging results and packaging efficiency. This output may also be used to update user files with packaging results.

An Example of a Packaging Run Using FACTS

For a given funding period, applicants are grouped into categories within a group file according to predetermined criteria (the grouping parameters). In setting the criteria, the financial assistance office takes into account program eligibility criteria and its best judgment of how the program funds can most equitably and most efficiently be distributed. The grouping can be done on a weekly, biweekly, or monthly basis, or on the basis of filing characteristics, for example, late filing or incomplete application.

Each student record in a particular group is processed sequentially. As a student record is scanned, decisions are made concerning the student's eligibility for each of the aid programs on the funding file. Suppose, for example, a student has applied for a Pell Grant award. If a check of the selection criteria for the Pell Grant program indicates the student is eligible and if the limits for the program have not already been reached, the student is awarded a Pell Grant. This information is indicated in the student file and, concurrently, the packaging fund file is debited the amount of the award. This completes the first part of the packaging run.

If our hypothetical student has applied for other need-based aid, was not in a "Pell only" group, and has need not satisfied by the Pell award, his or her record continues onto the next part of the program. At this point, the student's eligibility for a second series of awards including those sponsored by the Bureau of Indian Affairs, the Social Security Administration, and the Veterans Administration, as well as other specific scholarship programs is determined. If eligible for one or more of these, the student is awarded, the student's record is again changed to indicate the

award, and the respective packaging fund file is debited the amount of the award. If at any time during the process of packaging awards to the student, his or her individual need is totally met, then packaging ceases and no additional awards are made to the student.

The remaining funds come from the work and loan funding files. If the student has indicated a desire to receive either a College Work-Study or a student loan award and has need unmet by grant and scholarship programs, the student's record is passed to the work and loan part of the program. If eligible for these kinds of awards, the student's record is processed; if not, packaging ceases and the student is awarded whatever funds have been allocated through the earlier awards process. Depending on the specific programs applied for, the student's record is first processed for loans (nursing, National Direct Student Loan, Federally Insured Student Loan, Guaranteed Student Loan) and then work-study funds. Awards from these programs are distributed sequentially; awarding from a particular fund file ceases when the student's need has been met or the funding limits of the program have been reached. An applicant who is dissatisfied with the particular combination of work and loan awards received can request a repackaging of this portion of his or her aid.

Special Features of FACTS

FACTS allows the award process to be closely monitored. The FACTS program makes available to the aid office and other interested parties, both on a routine basis and as requested, award and denial information; application and disbursement statistics; running balances of the various aid funds and projections of how fast they will be depleted at a constant rate of utilization; and, for a particular pattern of aid application and a particular set of grouping parameters, a projection of the types and amounts of aid that will be needed at various times during the funding cycle.

FACTS can be run in simulation. This means that for any funding cycle scenario, that is, "who applies for what and when," the aid officer can test the equitability and efficiency of different funding formulae, that is, "who will get what and how much." He or she has the option of choosing a formula that will result in the holding back of funds for late applicants and can fine-tune the formula so that refunds are retained in specific amounts at specific points in time. Furthermore, after a formula has been selected and award packaging has begun, the aid officer can adjust the formula if the anticipated pattern of application does not hold and his or her projections indicate that the original formula will not yield an award process that is both as equitable and as efficient as possible.

Developing a Microcomputer Model: MINIFACTS

While FACTS was being developed and tested, the project researchers were also designing a student aid model for the microcomputer. The Financial Aid Computerized Tracking System for Minicomputers (MINIFACTS) is a microsoftware data base management system (written in BASIC) which permits the user to track both student financial aid applicants and aid funds and to project aid funds. This is accomplished through five program subroutines.

The "Initialize System" subroutine is used to specify the institution's name and address, any category of applicants to be targeted, and the amount of each aid category available for funding. With "Student Records," the user can record and update student financial and demographic information. "Funding Analysis" produces information about the types of aid that have been awarded to various categories of students and can also provide one-, two-, and three-month projections of the amount of a given aid fund available. "Enter School Records" enables the user to change institutional information or the system password without resetting fund amounts established in the Initialize System subroutine. With activation of the "Ter-

minate" subroutine, funds that have been disbursed are calculated and the student files are sealed until the next operating session.

These options allow the MINIFACTS program to track the progress through the application process of any designated subgroup of applicants an institution may wish to target. For example, monies in the campus-based aid programs for disbursement to disadvantaged students of any description can be projected at any point in the application process. The program can also calculate the amount of money remaining in campus-based or institutionally controlled aid programs and project the date when, assuming a constant rate of utilization, funds from these programs will be depleted. The seven fund types the program encompasses are: Scholarships, National Direct Student Loans, Supplementary Educational Opportunity Grants, College Work-Study, Nursing Loans, Pell Grants, and Federally Insured Loans. MINIFACTS is written to run on the Apple II and Apple III microcomputers but can be adapted readily for use with other brands.

Summary and Conclusions

To alleviate financial obstacles to college attendance, the federal government continues to appropriate massive financial resources for student assistance. The equitability of the distribution of these resources is problematic, however. "Faced with intimidating application forms and procedures and inadequate counseling, many needy students may not be receiving assistance intended for them" (College Entrance Examination Board, 1981, p. 10). On some campuses, students from very low income families are more likely than their middle income peers to submit incomplete, inaccurate, or late applications, thereby reducing their chances for awards from the various programs of campus-based aid.

This paper describes the approach taken at one institution to address this problem. Researchers at Arizona State University developed a mainframe computer model with the capacity to maximize awards to disadvantaged students. FACTS, now operational at Arizona State University, is a versatile aid packaging system with grouping parameters that allow specific categories of students to be targeted for, or excluded from, specific kinds of financial aid. Furthermore, limits can be set on the amount of aid that is awarded from a specific aid program to students in a specific category of aid applicants. Limits also can be placed on how much of a program's total funds are disbursed by a given point in the funding cycle. In this way, monies can be held back for late but needy applicants. Because the program can be run in simulation, funding formulae can be tested for their equitability and efficiency within particular pattern-of-application scenarios. The Arizona State University researchers also developed a student award model for use with the minicomputer. MINIFACTS has student and fund tracking and fund projection capabilities. While it cannot project the type of student demand for particular funds during the funding year, it is able to project the depletion of particular funding accounts and the approximate rate of depletion.

In the final analysis, the equitable distribution of financial aid depends on an institution's value system. Colleges and universities have always faced the problem of deciding what types of students they wished to award with what types of campus-based aid. The development of computer programs like FACTS and MINIFACTS does not remove the burden of making such decisions: the sophistication inherent in such systems serves to introduce more flexibility into the hard decisions about the distribution of financial aid and to make the results of such decisions more visible to decision-makers. Because they can project and, in the case of FACTS, simulate the outcomes of implementing particular distributional formulae, FACTS and MINIFACTS greatly assist the aid officer in planning an equitable and efficient distribution of aid throughout the course of the funding cycle.

As award packaging systems, too, FACTS and MINIFACTS have advantages. Their use greatly reduces clerical time; the financial aid practitioner can redirect time otherwise spent on routine processing of applications to the more important tasks of interacting directly with students and contributing to the formulation of the institution's financial aid policy. The excellent monitoring and reporting capabilities of FACTS and MINIFACTS provide the aid office (and, in turn, other interested parties) with timely application, award, denial, and disbursement information, both for individual students and for specific categories of aid applicants.

FACTS and MINIFACTS are not unique. Comparable systems; some individually developed, others acquired from commerical vendors; are operational at other institutions of higher education. By describing the development and implementation of FACTS and MINIFACTS in some detail, the authors hope to motivate administrators in institutions yet to implement such programs to think seriously about the benefits of a computerized student financial system that is capable of addressing both the special needs of financially disadvantaged students and the pragmatic concern for efficiency.

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