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Enrollment Management Dynamics of Adult Undergraduate Degree-Completion Business Programs at Private Universities

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Abstract

This paper presents a general system dynamic model for enrollment management of adult undergraduate degree completion programs at private institutions. It focuses on a university goal of maintaining a quality business education program given the rapidly changing business environment and shifting demographics of the prospective student population. The model is based on experiences of the authors with undergraduate degree completion programs at two different private universities in California. The model is concerned with the structures and decision points within the university that create a successful program in the 'good times', but fail to anticipate and build for the 'bad times'. It is time to use system dynamic tools to focus on characteristics that could stabilize enrollment for these degree programs. We recommend that management explore strengthening student, faculty and infrastructure quality, developing strong alumni programs for its graduate, and supporting adult students through scholarships.

Introduction

Today, higher education programs support a diverse and shifting demographic student population. For example, the National Center for Education Statistics (1999) has documented at the national level that the undergraduate enrollment for persons age 25 and over rose by 41 percent from 1980 to 1999 while enrollment of students under age 25 increased by only 13 percent. The public community colleges in California now serve adults who are working towards degree completion in numbers exceeding those who are not in degree completion programs. Many of these students complete two-year degrees such as the Associate of Arts degree at the community college, and then enter four-year colleges or universities to complete their undergraduate degree programs. In addition, young students (i.e., age 18-21) enrolled in four-year undergraduate programs at state and private institutions may drop out after two years, enter the workforce, and then realize that they need the bachelors degree for professional development.

Community colleges and universities/colleges in the United States have developed programs for working adults that have transformed the nature of the 'typical student' attending higher education. Although traditional four-year undergraduate and graduate programs have participated in the aging of the typical student over the past two decades, it is those degree completion programs designed to be particularly accessible to the working adults that have created a new profile for students. These degree completion programs, commonly offered by private colleges and universities, are designed to serve working adults who bring the equivalent

of their freshman and sophomore years already completed, and are now prepared to complete undergraduate majors (junior and senior level) and receive bachelors degrees.

It appears that there will be a continuing demand from adults needing community college education in California. Over the next decade the number of older students (25 years and older) in California will rise by 17%. Presently 6.5% of those adults participate in higher education which is considered to be a benchmark number (ideal) for the nation according to the Community College Policy Center (2004); it appears that they can be served at the same 6.5% rate ten years from now. However, during this same period there is a substantial (41%) participation gap for younger students which means that 581,000 of those people will end up needing to become educated as older adults since the in-state resources are not available for traditional undergraduate education.

However, the current decline in adult student enrollment in community colleges (12% decline in the past five years in San Mateo County for example) belies the expectations for continued adult enrollment. The adults are there, but they may not be going to college at the expected rates. Why?

Specific Needs of the Working Adult in an Education Program

Working adults aged 24 years or older typically can only enter and complete an education program that will allow them to work and earn the money necessary to maintain an adult life-style. Adult degree completion programs are designed to meet special needs of the working adult. For example, classes are typically offered on weekends or evenings, and often with reduced class meeting time (commonly called 'intensive'). Programs are offered away from campus, in other population centers, making them more readily accessible to those students who live or work nearby.

Enrollment has increased in these programs especially over the past two decades, as many universities have taken advantage of the interest and have created highly cost-effective programs. Universities have been able to enter the area of working adult education because these programs have recently shown a net profit that added to the general university funds. Within the university, the programs are often managed separately from the traditional undergraduate residential and day programs. Typically taught using a higher proportion of part-time faculty, and with a minimum of classroom materials, the courses can be offered at relatively low cost to the university.

However, the declining employment conditions of the past three years correspond to a decline in enrollment in these programs. Universities are being caught short by loss of revenues, and must decide whether to reduce their offerings. They had not anticipated this enrollment drop, and are not prepared with contingency plans or funds for implementing new strategies for serving and attracting students.

The increase in unemployment has a direct effect on whether there are potential students for these programs. Participants must bring their own tuition money to the school. Unlike undergraduate day programs, the university typically offers very little in scholarships or grants to the adult student. Students pay by savings, loans (Federal Government education loans are

readily available for working adults), or tuition assistance from their employers. Adults who have recently lost their job, or working adults whose employers have economized by reducing tuition reimbursement, cannot continue to pay private education tuition.

Methods

Systems dynamics modeling is an approach to understanding complex organizational systems (Sterman, 2000). A graphical specification language is used to define key elements and their quantitative relationships with each other that create the dynamics of changes in the variables. Using the *Vensim PLE* (Ventana Systems, 2003) product (free to educational institutions, thank you!), we define what we think are important elements of the enrollment management system for two university programs for the adult student who is completing an undergraduate degree. The dynamics of the enrollment management model are tested using *Vensim PLE* to simulate the model. The model is presented and discussed first as three subsystems: *Student Enrollment Aging Chain, New Student Recruitment, Program Investment*. Then a proposal is given for integrating the three subsystems into the Full Version model, and we discuss how it can be used by managers to test hypotheses and to plan a more responsive enrollment management system.
All figures in the paper were generated using *Vensim PLE*.

Results and Discussion

Systems Dynamics Model

In this paper, we present a systems dynamics model that includes elements within the private university, which we believe importantly, contribute to the enrollment dynamics in an adult degree completion program in business. We are unable to present actual university data since it is proprietary, but the model is based on management processes observed at these institutions, and the artificial data used here is realistic. The model can be used as an educational tool for university management in planning its response to changing enrollment patterns.

The goal of the managers of the adult undergraduate degree completion system is to maintain a quality business education program in the face of the rapidly (semester by semester) changing demographics of the prospective student population. Enrollment dynamics are assumed to be manageable by the institution. External variables outside the institution's control include the size of the pool of potential students, unemployment rate, and employers' ability to provide tuition reimbursement.

Most working adult education programs are year-round, with students enrolling, quitting, and graduating every semester. Because enrollment managers track enrollment and graduation every semester, many management decisions are made on a semester time scale. The timing of the simulations will be based on a one-third of a year semester.

Subsystem - Student Enrollment Aging Chain

The first subsystem to consider is the basic aging chain of new students, enrolled students, and graduating alumni. From a financial point of view, the university focuses on the goal of maximizing the number of students enrolled in the university each semester.

Figure 1: Student Enrollment Aging Chain Subsystem Model

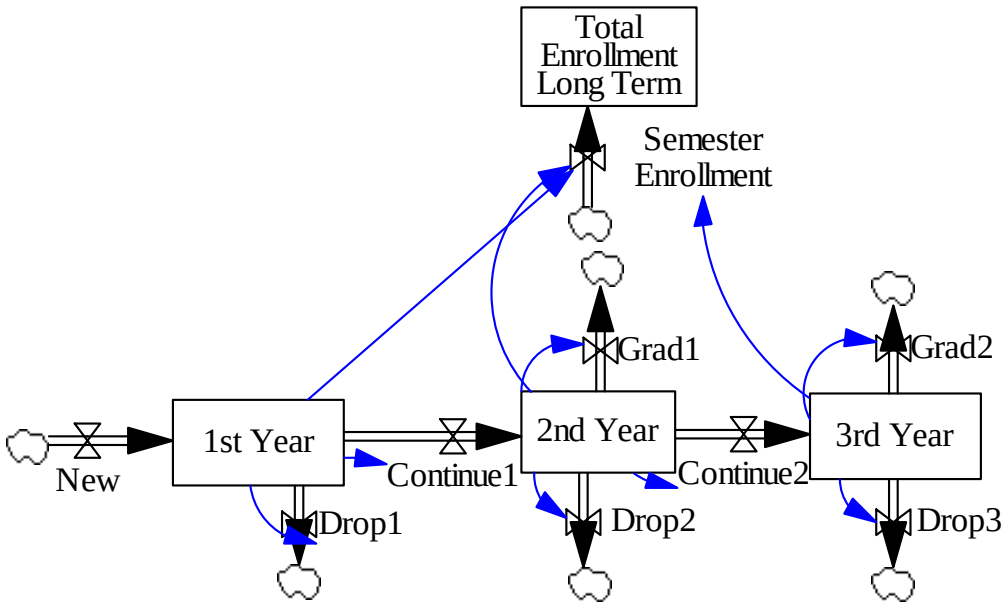


Figure 1 (Student Enrollment Aging Chain) models the basic flow of students into the enrollment chain. Following the flows from left to right, adults enter as new students and continuing from two to three years to either graduate (flow up) or drop out of the program (flow down).

The rates (flows) that determine the length of time students remain in the university system include:

- *New*: new students entering during a semester
- *Drop1*, *Drop2*, *Drop3*: students enrolled during a given year (first, second, third) who Quit the program and do not return.
- *Continue1*, C*ontinue2*: students enrolled during one year who continue to enroll in courses during the next year.
- *Grad1*, *Grad2*: students who graduate during the second or third year of being enrolled in the program.

At any given time, a student is in one of three age-class states represented by level variables (also called 'stock' or 'reservoir' variables; Sterman, 2000):

- *1st Year*: the number of students enrolled during a semester who has been in the program less than one year. Each semester, it decreases by drop-outs (*Drop1*), and students who age to become second year students (*Continue1*), and increases by *New* students entering.

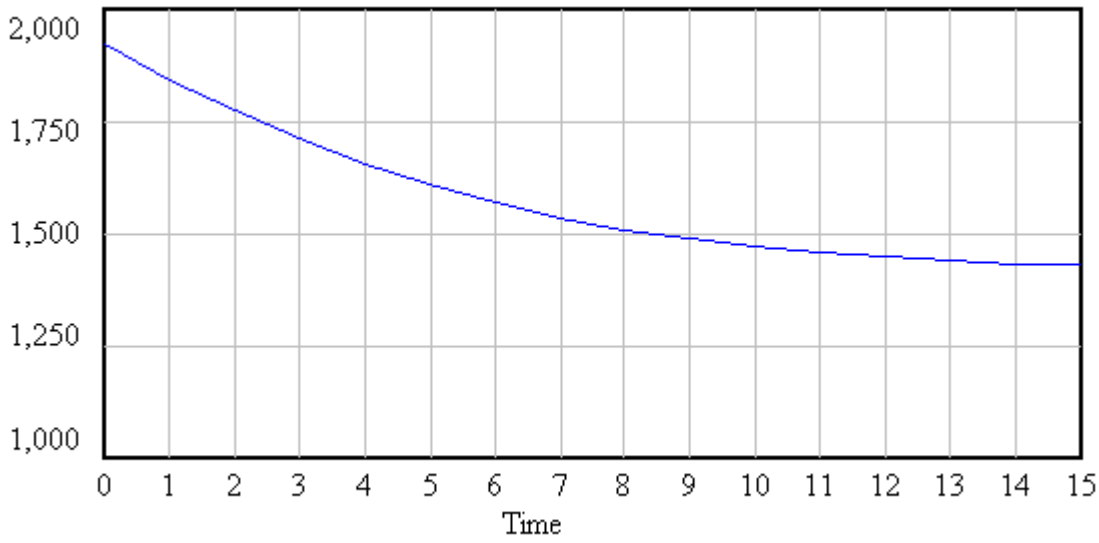
- *2nd Year*: the number of students enrolled during a semester who has been in the program between one and two years. Each semester, it decreases by drop-outs (*Drop2*), and students who age to become second year students (*Continue2*), and increases by students entering from their first year (*Continue1*).
- *3rd Year*: the number of students enrolled during a semester who has been in the program between two and three years. Students enter this state by continuing from their second year (*Continue2*), leave this state by dropping out (*Drop3*) or graduated (*Grad2*) by the end of three years.

At any given time, the level variable *Total Enrollment Long Term* represents the total number of students who have been enrolled in the university since the beginning of tracking (simulation of the system). This serves as an index for gross tuition income for the university. It is the cumulative sum of *1st Year*, *2nd Year*, and *3rd Year* enrollment during any semester.

Figure 2 is a graph of student enrollment in the system over 15 semesters (five years), using realistic, but artificial data. Dropout rate for first year students is 20%, second year is 20%, and third year is 10%. The graduation rate during the second year is 10%, and is 90% in the third year. The figure shows that with a constant enrollment rate of new students (*New*) a stable enrollment will result. In fact even starting with different ratios, after five years there will be stable ratios of: *1st Year / New* = 3, *2nd Year/ New* = 2.4, and *3rd Year / New* = 1.68.

In Figure 2, with a constant inflow of 200 students per semester enrolling, the *Semester Enrollment* will stabilize at about 1,416 students per semester.

Figure 2: Semester Enrollment for Student Enrollment Aging Chain Simulation



Enrollment managers can use this simulation to study the impact of improving variables such as new student enrollment rates, dropout rates (and its obverse *retention rates*) and graduation rates. Managers can decide where to focus attention by simulating the consequences of making small changes in rates. For example, increasing the annual graduation rate during the second year by 10% (semester rate, *Grad1* = (0.20/3)), and decreasing the first and second year dropout

rates by 10% (semester rates, *Drop1*, *Drop2* = (0.10/3)), results in a stabilized *Semester Enrollment* of 1,517, a 7% increase of 100 students from the Figure 2 example.

Subsystem - New Student Recruitment

A central university recruitment and admissions office typically manages the flow of new students into the adult degree completion program system. All levels of analysis and planning are managed along with the other undergraduate and graduate programs. Recruiters have learned to use a wide variety of approaches including distributing information to adults working in local businesses and government organizations, and advertising through local newspaper, radio, and television. Some universities spend more in public advertisement than others. Over the past three years, the yield on advertising dollars has decreased substantially.

The following subsystem does not include the complex world of advertisement, but reflects other elements that we feel impact recruitment of new students. Chief among these is the current local unemployment rate. The effects of unemployment seem clear: working adults who lose their jobs cannot afford to pay private tuition; working adults who are afraid of losing their jobs are not willing to risk the investment. Increased unemployment reflects the downturn in business, and companies that previously supported students with tuition reimbursement programs have to cut back on that support. For example over the past three years unemployment has more than doubled in many urban areas. At the same time in our experience, adult working students whose employers supported tuition reimbursement in the past, experience a decline from 100% tuition reimbursement to an annual cap of $7,500 (approximately half the tuition needed) or even no reimbursement.

Recruitment of students for the traditional undergraduate programs commonly builds heavily on reputation, and relies on alumni programs to assist recruitment of new students (as well as funds donated to the university). Since the working adult programs are relatively young, there has not been a large alumni base to call on for student recruitment (and for donated funds). It may be time to reexamine use of the developing adult program alumni as a resource for recruiting students into the adult undergraduate programs, (as well as development of funds to support those programs).

Programs for working adults have been set up to meet the adult's lifestyle needs. As discussed earlier, the universities have created alternative course delivery designs, and explored ways of improving 'Convenience' for the adult student. However, it may be that more attention and institutional investment needs to be given to these programs to make them more accessible to busy working adults. For example, as universities are experiencing decreased enrollment, they are cutting down on course availability making the programs even less accessible.

Students who enter adult degree completion programs have already devoted time and energy to university work. One direct source of prospective students is the older adult population enrolled in local community colleges. Even though degree completion students come from other backgrounds, the number enrolled in community colleges reflects the current interest of that cohort in degree completion.

Figure 3: New Student Recruitment Subsystem

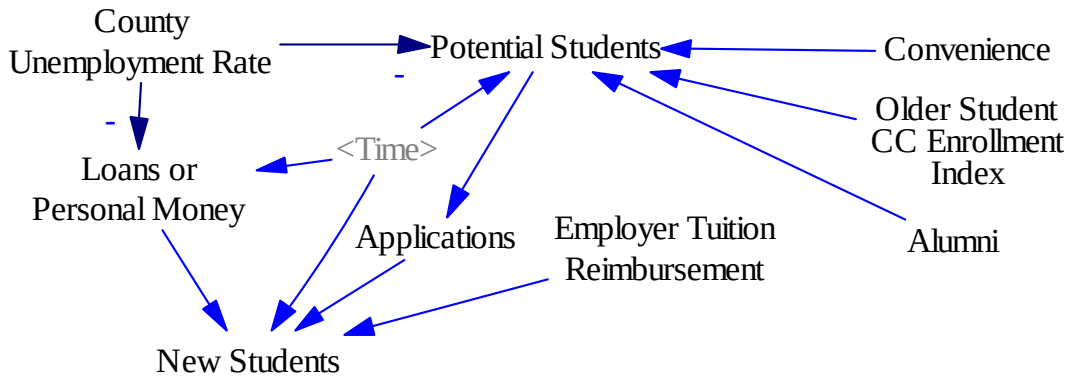


Figure 3 (New Student Recruitment) models the influences of unemployment, program convenience and the size of the program's total alumni pool on the number of adults who show potential interest in the program. People who are willing to apply to the university's program first have to be able to see the program as potentially affordable and doable. Applicants decide to become new students based on money availability (loans, personal savings, employer tuition reimbursement).

The variables in the simulation model that directly or indirectly determine the number of new students entering during a semester include:

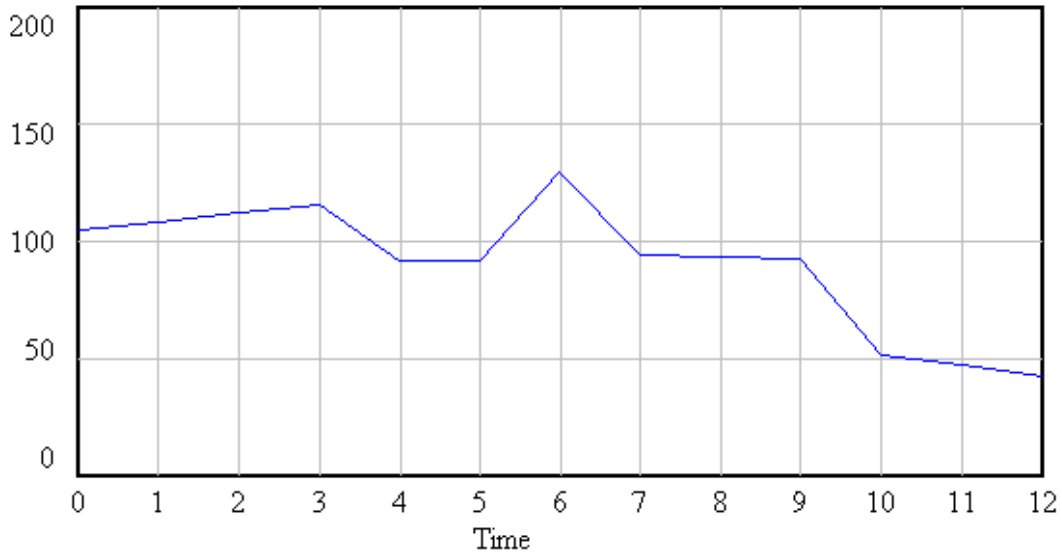
- *County Unemployment Rate*: the average monthly local unemployment rate during the previous semester (three months). Simulation data can include actual county unemployment data over the past.
- *Convenience*: a synthetic variable reflecting relative convenience of the program, ranging in value between where 0 for unacceptably inconvenient to 1.0 for maximally convenient. This is strictly estimated and arbitrarily scaled.
- *Older Student CC Enrollment Index:* the proportion of older adults (more than 24 years old) currently enrolled in local community colleges, compared to the maximum in the past. Simulation data can include actual community college enrollment data over the past.
- *Alumni:* the number of alumni who have graduated from the program since its inception. University records provide exact data is available for simulation.
- *Employer Tuition Reimbursement:* average proportion of semester tuition paid through employer tuition reimbursement. Estimates of actual data can be made for students enrolled, although records are not complete.
- *Potential Students*: the number of adults who are interested in the program during the previous semester. This is influenced by whether adults have jobs (*County Unemployment Rate*), the number of current (and active) *Alumni*, and the number of older students actively pursuing degree completion (reflected in *Older Student CC Enrollment Index). Potential Students* can be verified against inquiries that are received by the university.
- *Applications*: the number of *Potential Students* who also apply to the university. The conversion rate can be based on actual university experience.

- *Loans or Personal Money*: a synthetic variable reflecting relative availability of money (loans or personal) for tuition, ranging in value between 0 for none available to 1.0 for easily available. This is influenced by current economic conditions reflected by *County Unemployment Rate*, since a working adult's willingness to take on personal debt or spend savings may go down as unemployment rate increases. Simulation data can be based on correlations between unemployment rate and students' use of loans and personal money in the past.

The manager can focus on the number of *New Students* entering the program each semester as influenced directly by the number of students who have submitted *Applications*, been accepted, and decided to enter based on availability of money for tuition (L*oans or Personal Money* and *Employer Tuition Reimbursement).*

Figure 4 illustrates the declining number of new students each semester despite the increase in the alumni pool, due to the effect of an increase (doubling) of county unemployment rate, an increase then decrease to half for Convenience factor, a decrease to half for employer tuition reimbursement, and a decrease of 10% enrollment of older adults in community colleges. These are artificial but realistic data for the past five years.

Figure 4: *New Students* enrolled per semester from New Student Recruitment Simulation



Subsystem - Program Investment

Over the past two decades, working adult degree programs have proven to be productive sources of money for many universities. With working adults willing to pay private tuition rates, the universities have not had to invest heavily in full-time research or teaching faculty, or in the same physical plant necessary for attracting and maintaining other programs. Commonly, most of the instructors are part-time professionals from the area, and classes are even taught in temporary locations off-campus. These programs can therefore represent a relatively low risk effort for the university, and can be disbanded with little loss of investment. The question is

whether this is what universities want to do when the enrollment declines and the programs no longer net the same income for the university.

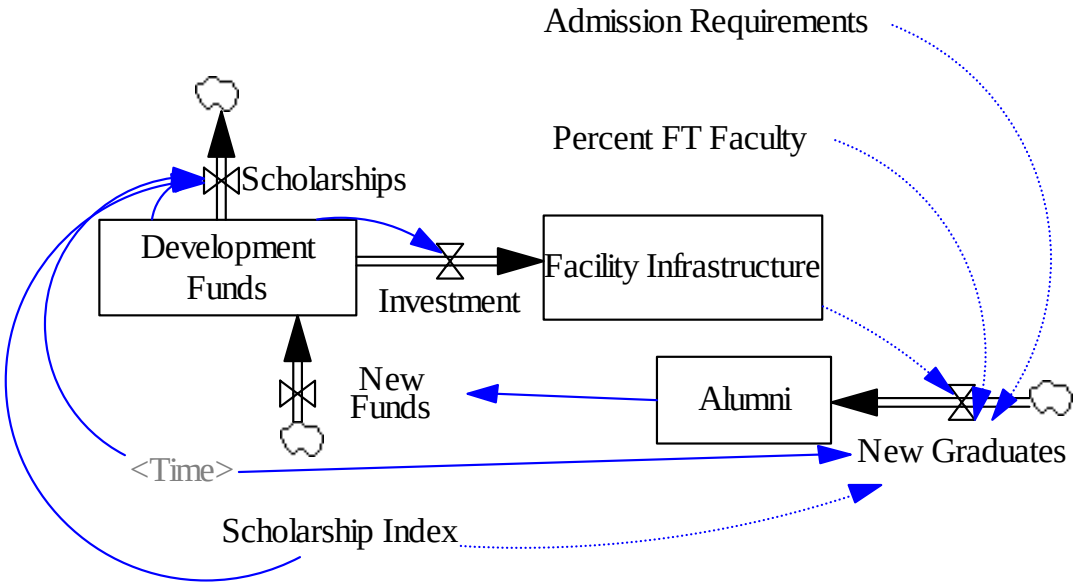
If there will be an ongoing need for adult degree completion programs in the future, then what is the wisest approach for the university to attract a stable enrollment in these programs? It may be that enhancing the reputation of the institution by improving the quality of the delivered programs should be explored. The quality of the program depends on the quality of the students as well. Admission requirements for students entering classes can be raised, which could improve retention and graduation rates. Adult degree completion programs are often run outside of the Association to Advance Collegiate Schools of Business (AACSB) accredited programs of the university, and do not have to meet those requirements for full-time, tenure track faculty. Improving the stability and quality of the teaching faculty would probably improve student retention and educational experience.

In the future, a more expensive infrastructure will require a more stable (predictable) enrollment. Until recently, many universities have not planned for demand to decrease or fluctuate, and have not had to actively maintain enrollment level. For example, very little university scholarship money is given to working adults in these programs.

For some universities, the alumni pool for adult undergraduate student programs has only been built recently. Universities have not necessarily sought alumni support for adult student scholarships, or institutional infrastructure to support those adult programs.

Figure 5 (Program Investment) shows a model of the influences which alumni donations, infrastructure quality including faculty and facilities, could have on the resources available for stabilizing student enrollment.

Figure 5: Program Investment Subsystem Model



The key flows that create the dynamics for scholarship availability as reflected by *Scholarship Index* include:

- *New Graduates*: number of adult students graduating each semester;
- *New Funds*: dollars donated each semester to adult degree completion programs;
- *Scholarships*: tuition dollars made available to support adult students.

The key levels that support this subsystem include:

- *Development Funds*: cumulative dollars available during a semester for investing in infrastructure and scholarships;
- *Facility Infrastructure*: cumulative dollars invested in physical facility and other resources for adult degree completion programs;
- *Alumni*: current active alumni pool.

Other elements of the system which have a delayed effect on the system and ultimately affect the number of *new graduates*:

- *Admission Requirements*: an index such as the proportion of maximum for entering students' average GPA. This reflects the entering student's ability to handle the academic work that ultimately affects the drop out rate.
- *Percent FT Faculty*: proportion of courses in the program taught by full-time (FT) faculty. This will be a quality measure that affects drop out rate.
- *Scholarship Index*: the proportion of tuition reduction when students are entering as new students. This will affect student's ability to enter and to stay in the program and become *New Graduates*.

Figure 6: *Development Funds* accumulated over semesters (Time) from Program Investment Simulation

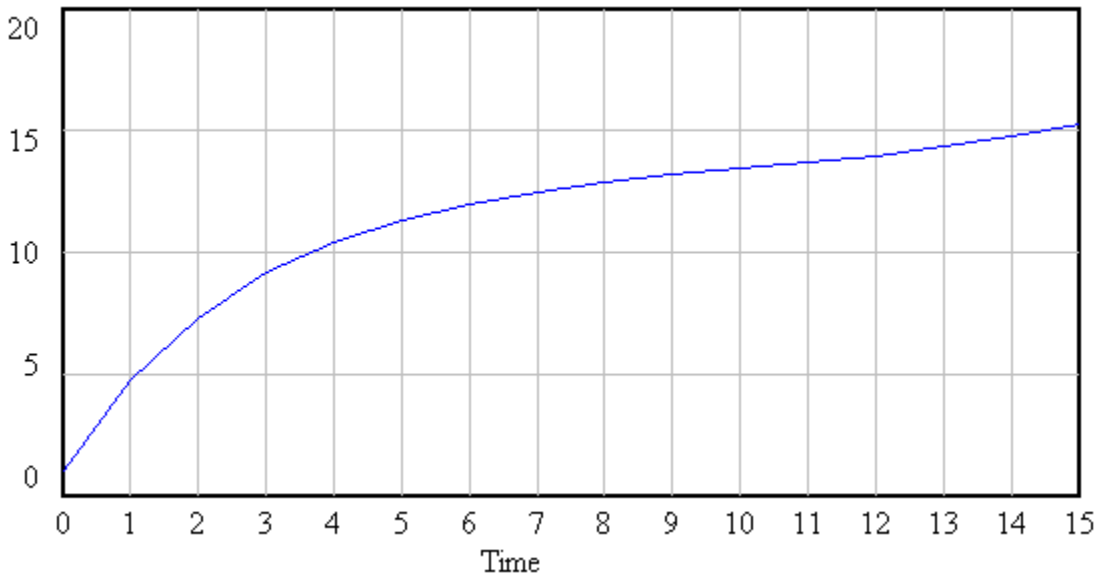


Figure 6 shows that that in this simulation, the total development funds continually build as the alumni pool continually increases. Figure 7 and Figure 8 show the behavior of *New Graduates* and *Scholarships* over the semesters in this system where quality measures (*Admission Requirements, Percent FT Faculty, Facility Infrastructure*) increase over time, and a financial support index, *Scholarship Index,* also increases over time. This is artificial, realistic data. As can be seen, increasing scholarship funds will, eventually, lead to an increase in new students. Notice that there is a delay of almost three years (nine semesters) before the impact of the scholarships will impact the new students. This is because graduating students must first become alumni, and then those alumni can drive up student recruitment and funds for more supportive scholarships.

Figure 7: *New Students* over time from Program Investment Simulation

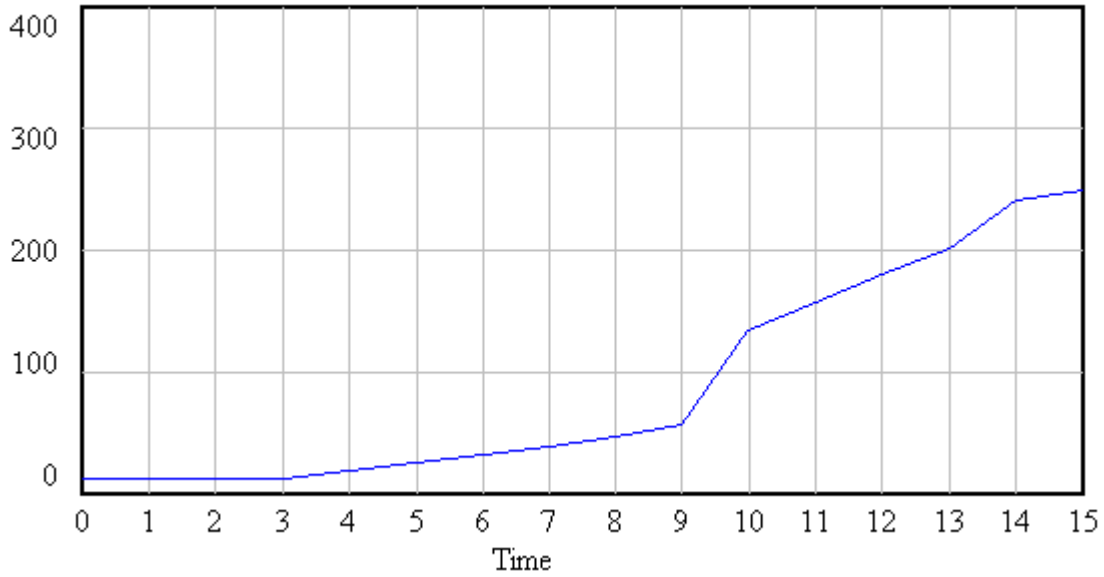
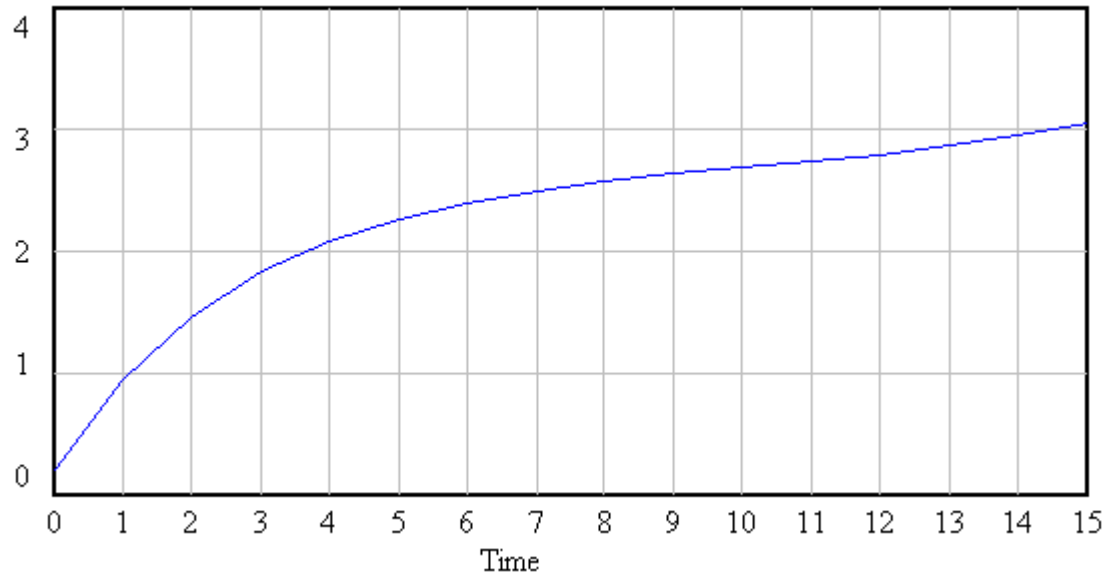


Figure 8: *Scholarship* dollars each semester from Program Investment Simulation



In any given semester, the number of new students who graduate will be influenced by the financial ability of those students to begin and to stay in the program, the academic ability of the student to complete the program, and the support system. The manager would track *Scholarships* and the number of *New Graduates* over time. If the number of new graduates was in threat of dropping, then the availability of scholarships should be increased. However, the funds for scholarships depends on a growing alumni population which depends on increasing numbers of new graduates, so there is a tension in the system between needing more students to become alumni to support decreased numbers of new students.

Clearly, the university must be willing to save money as represented by *Development Fund* during the good times in order to pay for this kind of system stabilization during the bad times.

The Full Enrollment Management System

The three subsystems, *Student Enrollment Aging Chain*, *New Student Recruitment*, and *Program Investment* are brought together in a *Full Enrollment Management* system model as shown in Figure 9. The linkages between *Student Enrollment* and *Program Investment* reflect the capability of investing in more facilities, full-time faculty, and academic standards to improve retention and graduation. The linkages between *Student Enrollment* and *New Student Recruitment* reflect the capability of increasing potential students and driving the enrollment higher. The bold arrows and variables shown in the figure indicate internal processes that the university can control and potentially use to improve the maintenance of the enrollment chain.

In this model there are two very clear positive (reinforcing) feedback loops which both eventually link *Alumni* back to *New* student enrollment. The *Alumni* variable provides the only actual source of headcount of new students (*New*) in this model. The more students who graduate, the more alumni; the more alumni, the more potential students, and then the more new students who enter the system, and ultimately increase numbers of students graduating. Through *New Funds*, *Alumni* provides the only actual source of new dollars for *Development Funds* in this model; the more students who graduate, the more alumni who donate more funds; the more funds, the more scholarships, which leads to more new students entering the system and ultimately increasing students graduating.

The integrated full system clarifies that managers can learn much about the different enrollment subsystems, and study them individually. However, a system without feedback loops is one that does not allow a counteracting response to internal or external sources (unemployment and tuition reimbursement).

Figure 9: The Full Enrollment Management Model

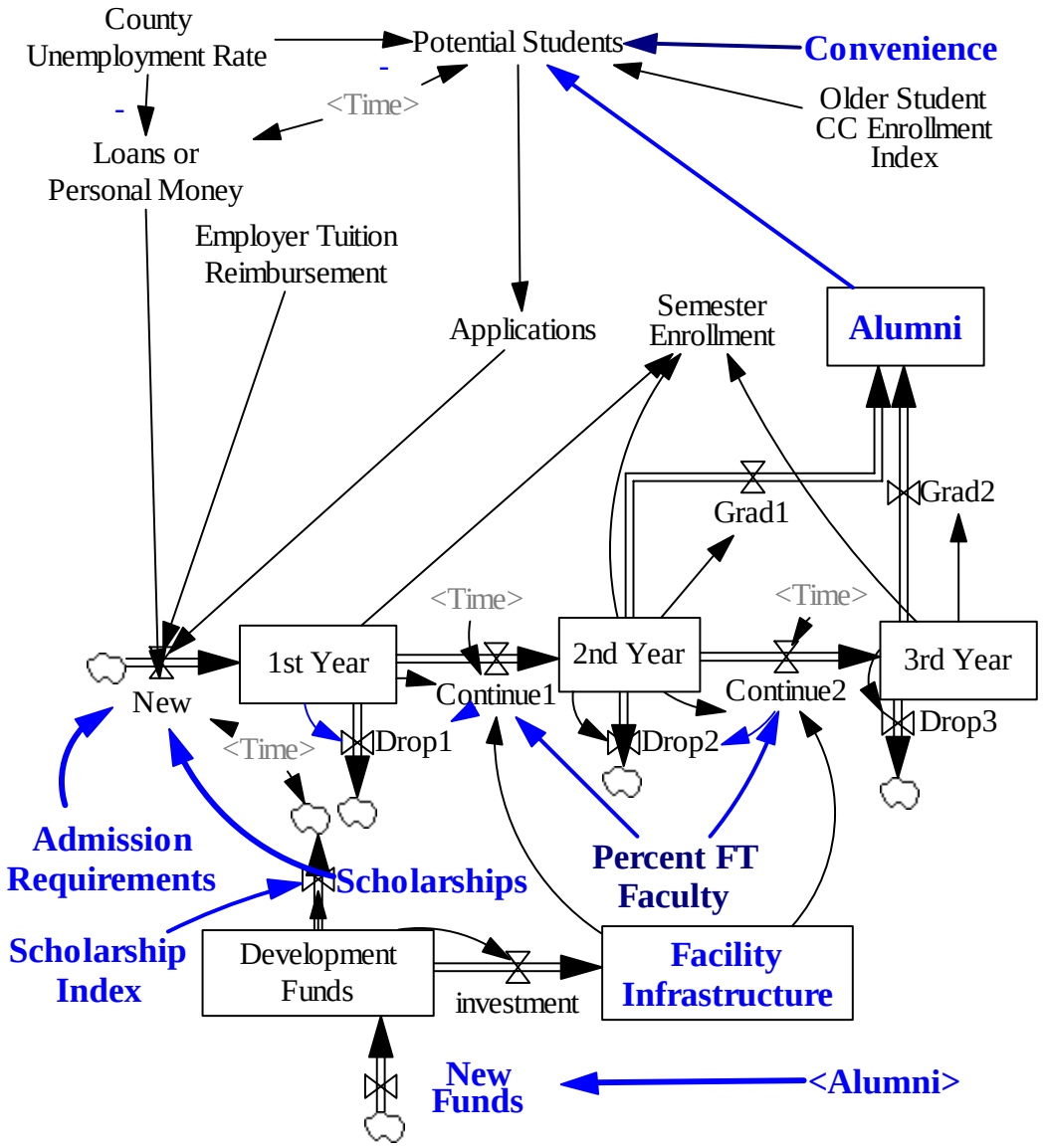
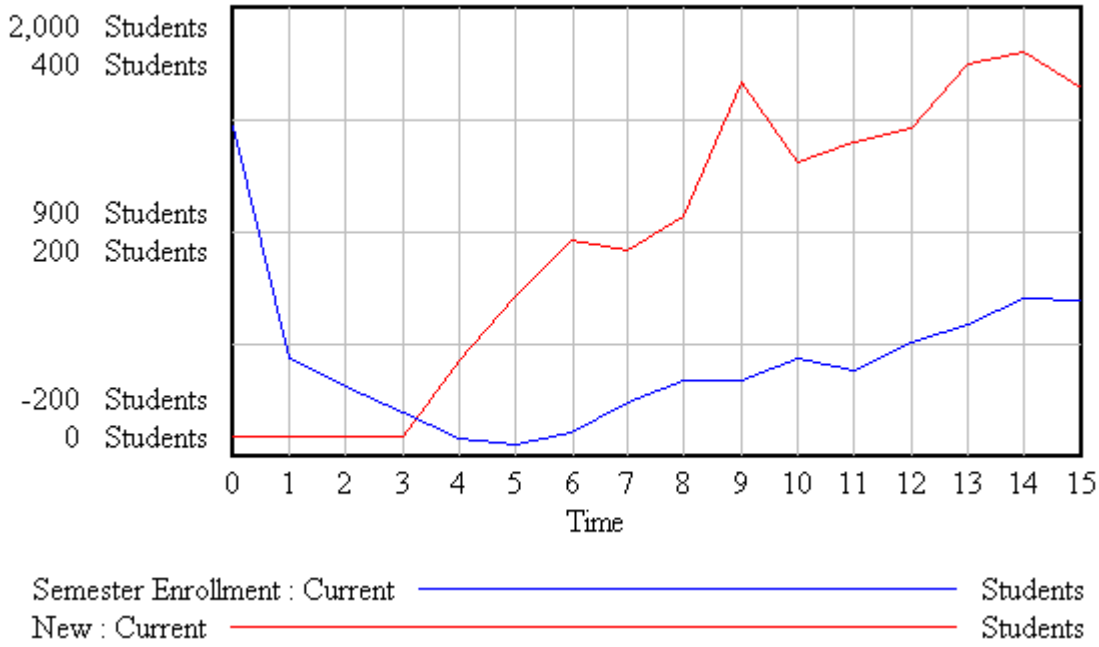


Figure 10 illustrates the interrelationships among *New* students entering the system and total enrollment during a semester (*Semester Enrollment*) when various mechanisms kick in to improve new student enrollment and enrolled student retention. This simulation began with a very low inflow of *New* students, when total enrollment (*Semester Enrollment*) was high due to previous 'good years'. Over the next six semesters, while scholarship money was made available (*Scholarships*), enrollment gradually increased. This simulation also included improvements (increases) in *Convenience* and *Percent FT Faculty* during the 15 semesters. Over the same time, external forces became worse. That is, *County Unemployment Rate* became higher and *Employer Tuition Reimbursement* declined.

Figure 10: *New* students, *Semester Enrollment* from Full Enrollment Management Simulation over 15 semesters (*Time*)



Conclusions and Recommendations

We recommend that enrollment management for our universities' working adult degree completion programs should be explored using systems dynamics modeling and simulation. Managers for these programs can develop and use simulations to explore the impacts of actual and potential internal (funding, program curricula and delivery models, academic standards, faculty hiring) and external (competition with other universities, economic changes, age structure changes) influences.

The models and simulations presented in this paper are very simple compared to the known reality of enrollment management. For example, where is the net profit computed, and how does the ubiquitous public media advertising budget figure into new student recruitment? How will changing age structure of the adult population affect future students' interest in these programs? Is the program content obsolete? What is the impact of competition from universities who newly enter this arena on the availability of the commons (potential students)?

Program managers can test the consequences of the relationships and structure of the whole system by using systems dynamics models to clarify the important elements, and where possible, simulate the behavior of the system using realistic numbers. These simulations help managers address questions such as: Will scholarships pay off in the long run? Will investing in full-time faculty pay off in quality and retention? Can the program sustain through a doubling of unemployment? Tripling? Will the changing age-structure of the local adult population mean a need to change the programs?

The year-to-year planning that has created the current programs generally assumes a stable, and even increasing, source of future students. If these programs are to be sustainable through bad times as well as good, they need to be managed so that they create their own resources to carry them through over the long time. As Galbraith (1998) demonstrates, universities need to be clear on how they will link funding to program development, and need to clarify what the ultimate goals are. Using system dynamics models and simulations, he demonstrated the unexpected and contradictory (to goals) consequences of practices in funding research, teaching and student recruitment.

Strengthening student, faculty and infrastructure quality, developing alumni as a source for potential students and funds, and new student support through scholarships are all mechanisms used extensively for creating stable traditional undergraduate and graduate programs in universities. It is time to bring the same approaches to the working adult degree completion programs.

References

Community College Policy Center. (2004). Closing the College Participation Gap; State Profiles - California. Retrieved February 12, 2004 from http://www.communitycollegepolicy.org/html/Issues/access/pdf/CA.pdf

Galbraith, P. (1998). System dynamics and university management. *System Dynamics Review Vol. 14, No. 1*, (Spring 1998): 69-84

National Center for Education Statistics. (1999). *Mini-digest of education statistics*. Retrieved March 30, 2004 from http://nces.ed.gov/pubs2000/2000036.pdf

Sterman, J. (2000). *Business dynamics: Systems thinking and modeling for a complex world*. Madison, WI: Irwin McGraw-Hill.

Ventana Systems, Inc. (2003). *The ventana simulation environment* (VensimPLE32 Version 5.1a) [Computer Software]. Harvard, MA. Retrieved February 14, 2004 from http://www.vensim.com

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