Implementing AACSB Standards Through Feedback-Loop Planning

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Abstract

To maintain the standards set forth by the American Association of Collegiate Schools of Business (AACSB), one thing a business school (B-school) must do is maintain a certain proportion of tenured faculty members to students. The AACSB standards also affect the process of reviewing tenure track faculty members for promotion and tenure (P&T). Typically, tenured faculty members are considered more committed to enhancing the reputation of a B-school and of the AACSB through research and publications.

This paper presents a system dynamics simulation model of the interrelationships among variables pertinent to hiring adjunct and tenure track B-school faculty. An ad-hoc committee of administrators, faculty and students of a relatively small prestigious B-school met to evaluate the implementation of AACSB standards and to consider the possible implications the school's recent expansion history might have on these standards five years into the future.

An important concern underlying the modelling process is that having less than fifteen students in classes is preferable to students. Smaller classes allow for more instructor-student interaction ,so the student better understands what the instructor requires and the instructor knows the student's special needs and skills. Estimates of the growth and attrition rates of both students and faculty affect administrative decisions on the number of adjunct and tenure track faculty to hire. Although the time a student spends in the B-school program varies depending on whether enrolled full-time or part-time, the student growth history, the student growth fraction and the student growth forecast are the variables that determine future student enrolment.

The model confirms that the inexorable nature of the P&T evaluation process makes the often desired balanced growth in B-school faculty a physical impossibility. Yet, the model's computed scenarios, which corresponding to alternative future student enrolment and faculty growth rates, show how the proportion of tenured faculty to student s may respond differentially to alternative growth strategies. An important implication of the simulation results would require the B-school administration to consider both ratios in making hiring and firing decisions for the B-school to maintain the current AACSB accreditation status.

Implementing AACSB Standards Through Feedback-Loop Planning Introduction

Introduction

B-schools have transformed themselves profoundly over the last 30 years. Faculty has moved from collecting and transmitting current practice to developing and communicating theoretical understanding of phenomena relevant to management, particularly, the management of complex decision situations (Rumelt, Schendel & Teece, 1991). In the late '50s, the impetus of the Ford Foundation and Carnegie Foundation as well as the Pierson (1959) report prompted extensive changes in B-schools. One far-reaching recommendation was to infuse B-Schools with rigor, method and the content of the basic disciplines: economics, mathematics, psychology and sociology. That recommendation was avidly followed. Alongside the traditional, professionally oriented faculty, the new discipline oriented faculty found scholarship in advancing theory, writing for those similarly placed, sometimes without resort to practice or application of acquired insight. Traditionally, B-school faculty found scholarship in studying business firms, identifying and transmitting knowledge about the best practice in the classroom, mostly through case studies or the occasional published article. Traditional faculty was frequently cast in consulting to practising business managers, often with greater financial reward than that found in scholarship alone. In time, set in motion was process that retired professionally oriented faculty in favour of discipline oriented scholars. While B-schools grew from granting about 10,000 to over 80,000 MBA degrees per year, they aligned their standards for hiring and P&T with the social sciences. Yet, in the early years of growth, well-trained faculty members were scarce in specialty areas, such as accounting, finance, marketing and operational research (OR). To fuel expansion, B-schools were quick to hire discipline oriented faculty, only later to worry about informing practice in business firms. A few faculty members made the transitition, but those with allegiance to their discipline continued seeking publications, not in the field in which they professed, but in the discipline in which they had been trained.

These were some of the war stories told in the initial meetings of and ad-hoc committee of administrators, TTF and students at a small but prestigious graduate B-school in New York City. The committee met to discuss the implementation of AACSB accreditation standards pertinent to student-faculty ratios, and to consider the possible effects of the school's growth on these standards, five years into the future. Broad discussions culminated into a system dynamics model that helped the committee assess the situation. The model captured relationships among variables pertinent to the B-school's hiring of adjunct and tenure-track faculty. An important concern expressed by the student participants related to class size. Consistent with the AACSB guidelines, small classes, ie., less than twenty students, are preferable to students who join the MBA 'experience' with a passionate commitment to acquire skills that will help them contribute to the revitalization of core industries. Small classes allow for more participant interaction that facilitates learning. Also, the students understand better what instructors require and the instructor knows each student's special needs and skills. This concern transpired throughout the modeling process, where the ideas of *premise description and partial model testing* helped to avoid the large gap in logic that model description and analysis often leave between the assumptions embodied in model equations and their simulated behaviour (Morecroft, 1983). The following section gives a brief account of premise description and partial model testing. Then the paper describes how these ideas were combined with behaviour-reproduction tests to build the project participant's confidence in system dynamics.

The data of Forrester (1961, Appendix K) argue against using measures of fit and point prediction to validate system dynamics models. Yet, Forrerster & Senge do acknowledge that behaviour-reproduction tests merit "widespread acceptance" (1980, p.218) in the modeling and simulation literature. With exogenous time-series input variables readily available and the econometrics background of project participants, confidence in the model could **not** have been gained alone by testing model structure, behaviour and policy implications. Although supplementary for system dynamics models, combined with Theil inequality statistics (TIS) (Sterman, 1984), premise description and partial model testing, the behaviour-reproduction tests allowed building the participant's confidence in the system dynamics model.

Rigor and Method in System Dynamics Intervention

It is a central idea in the systems view of organizations that well-intentioned decisions can cause unfavourable behaviour when combined (Churchman, 1968). This idea pervades the interpretation of decision situations encountered both in business (Hall, 1976) and in government (Allison, 1971; Friend & Jessop, 1969). Yet, a gap between a model's assumptions and its computed scenarios requires a transient leap in logic, often undermining confidence in models of business and social problems (Bell & Senge, 1980). These considerations support the necessity of an important task in the modeling and scenario construction phases of *scenario-driven planning* (Georgantzas & Acar, 1994; Schwartz, 1991). The task is to explain clearly how a model's underlying assumptions lead to its simulated behaviour.
To bridge the gap between model assumptions and simulated implications, Morecroft (1985) uses *premise description* and *partial model testing*. Premise description examines the bounded rationality in a model's assumptions, pointing out cognitive limitations in decision making. Partial model tests expose the intended rationality of combinations of policies or tactics, showing management's judicious actions regarding a model's assumptions. Contrasting partial - and whole-model simulations can clarify the causes of dysfunctional behaviour in a system.

Because of the anxiety that bounded rationality causes in decision making, Cyert & March (1963) used premise description to clarify the behavioural and cognitive assumptions of early simulation models. Objective rationality, ie, the synthesis of perception and analysis (Star 1990), guides the process of first unearthing and then describing assumptions. It allows answering questions peculiar to the situation under consideration, such as why some information is available in a decision process and not in another, why delay and distortion occur in the transmission and interpretation of information, and why bias is present. Answers to these questions point to empirically observed decision processes stemming from bounded rationality (Simon, 1976). Typically, the decision processes that behavioural models capture may be intendedly rational within the bounds set by common managerial practice. Also, they can be far removed from objective rationality. Strategic decisions, for example, often are intendedly rational concerning the assumptions made about the environment.

Like premise description, partial model tests had long been used in simulation to debug model sub-modules, but Morecroft suggest using partial tests to expose the intended rationality of managerial decisions. Again, what justifies this new and important role that partial model tests can play is that decision making is rational within the context of assumptions or premises in the decision makers' thinking. This condition allows decomposing a complex simulation model into pieces, while expecting simulation runs of the pieces to reveal intuitively clear, plausible behaviour. Partial tests should show that local decisions are well adapted to achieving local goals. Yet, localized rationality in decision making does not ensure that the behaviour of the system is well adapted to a firm's multiple objectives. Resulting from the coupling of decisions, dysfunctional behaviour is possible in the organizations because they often exhibit flaws in their design (Robey, 1982). The strength of partial model testing becomes apparent when a full-scale model exhibits counterintuitive and highly ineffective behavior. The surprising behavior of the full-scale model can be traced to the interaction of many intendedly rational acts. The coupling of decision processes can violate the assumptions or conditions for rational adjustment among decisions. Then their system is integrated in such a way that the rationality of the parts cannot satisfy the objective rationality required for success of the system. The contrast of partial and full-scale model tests can explain the unfavorable behavior of the system.

The following section illustrates the usefulness of these ideas, combined with behaviour-reproduction tests to gain the project participants' confidence in system dynamics. With TTF hiring prone to decline, a system dynamics model helped the ad-hoc committee of administrators, tenure-track faculty and students of a B-school assess its situation. The model describes interlinked decision processes, covering student enrollment and graduation, tenure-track faculty (TTF) hiring, promotion and retirement, and adjunct faculty (AF) hiring, renewal and dissociation. Interviews and discussions with administrators, adjunct faculty, tenure-track faculty and students, both during and outside the ad-hoc committee meetings, contributed to the model building process. It is worth noting that before joining the ad-hoc committee, two of its members had participated in a system dynamics course. The model focuses attention on the processes of attracting students internationally and from New York's tristate area. The structure and parameterization of these processes remain virtually unchanged from the original model. The rationality of the model preserves that of the original, empirically derived model. The rationality of the model preserves that of the original, empirically derived model. Importantly, the simulation results of the model exhibit behaviour that resembles reality for reasons that the ad-hoc committee found both plausible and persuasive.

Premise Description and Partial Model Testing

Following Morecroft's (1985) ideas, we trace changes in the ratio of students per faculty to the inauspicious interaction of student, TTF and AF growth. Partial model tests combined with behaviour-reproduction tests show how the decision processes of inducing growth in the student population, and hiring tenure-track and adjunct faculty may work when their rational assumptions are not seriously violated. Partial tests are then compared with tests of the entire model to reveal the causes of dysfunctional behaviour in the school's student to faculty ratios.

Premise Description #1: The Student (S) Sector

The average time (t:graduation) students spend in the program varies, depending on whether enrolled full time or part time. Past student (S) growth, S growth fraction (fr) and estimated S growth are the variables that determine student enrollment (fig 1) Equation (1.2) shows how estimated S growth is adjusted by the S growth fraction, which depends on exogenous socioeconomic variables as well as on the administrative decision to attract new students locally, internationally or both.

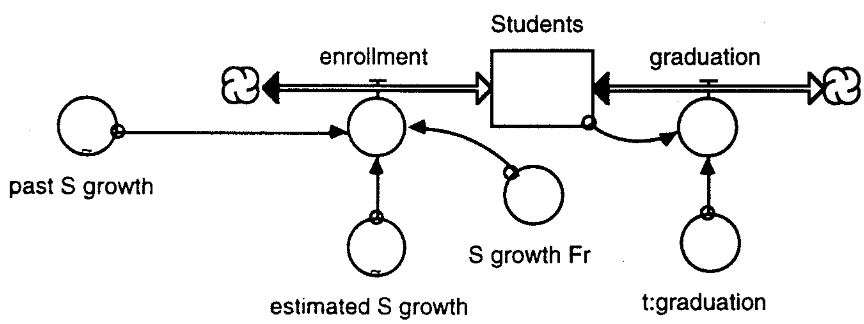

Fig 1: Student (S) Sector.

Students(t)=Students(t-dt)+(enrollment - graduation)*dt (1)
INIT Students=1135 (1.1)
enrollment=past_S_growth*S_growth_fr (1.2)
S_growth_fr=1 {dimensionless} (1.3)
graduation=Students/t:graduation {students/year} (1.4)
t:graduation=2 {years} (1.5)
past_S_growth=GRAPH(TIME) (1.6)
(1987,1135), (1988,1290), (1989,1474), (1990,1630), (1991,1745), (1992,1846), (1993,0)
estimated_S_growth=GRAPH(TIME) (1.7)
(1992,0), (1993, 1942), (1994,2009), (1995,2056), (1996,2084), (1997,2084)

The dimensionless 1 in equation (1.3) indicates roughly normal demographic and socioeconomic conditions, with routine administrative efforts to maintain a steady student growth. The graphical table functions in (1.6) and (1.7) contain exogenous time-series input functions of time. Historical data up to year 1992 were readily available from the school's records (1.6), while the Dean shared his projection for the next five years (1.7). These projections were based on purely demographic and socioeconomic conditions, excluding any extra efforts to increase student enrollment.

Partial Model Test #1: The Student (S) Sector

A partial model test was conducted by isolating the student (S) sector in Fig 1 and running it from 1987 to 1992. It is very easy to isolate sectors with STELLA (Richmond & Peterson, 1992). The software provides both a sector diagramming tool and a command under the 'Run' menu for isolating sectors and running partial model tests. With S_growth_fr=1, simulation length = 1987-1992 years, dt = 0.01 and integration method = Runge-Kutta 4, the test produced the results of Fig.2 (a).

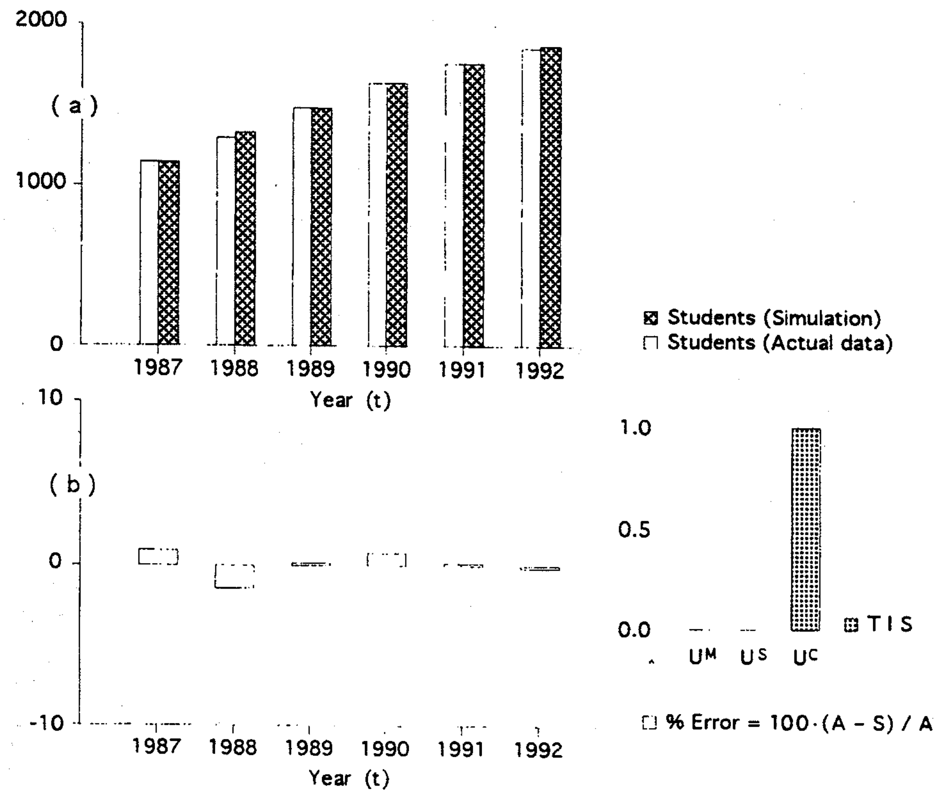

Fig 2:
(a) Student (S) simulation vs actual data, and
(b) Percentage (%) error and Theil Inequality Statistics (TIS).

The simulation data are smoother than the actual, showing that the simple deterministic model structure of Fig 1, incorporating and external resource inflow - with exogenous time-series input - and a draining outflow, can reproduce the S behaviour pattern over time. The small percentage - less than 10% - error and unsystematic error TIS plotted in Fig 2(b) helped to build the participant's confidence in the model.

Premise Description #2: The Tenure-track Faculty (TTF) Sector

The student (S) growth and faculty growth estimates affecting the decisions on hiring AF and TTF slightly complicate the structure of these sectors The tenure-track faculty sector in Fig 3 incorporates the process of promotion and tenure (P&T) evaluation. The inexorable nature of this process makes the often desired balance growth in the ranks of assistant, associate and full processor a physical impossibility.

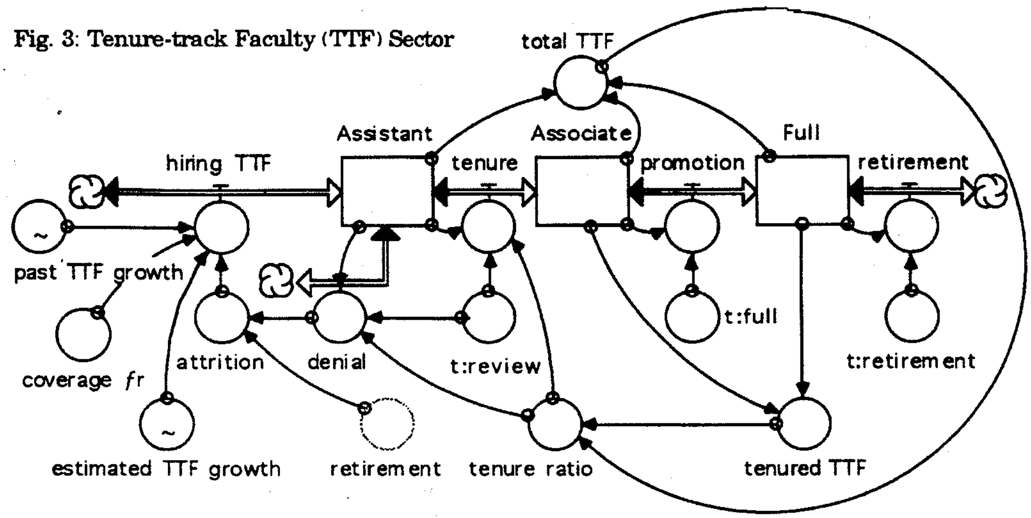

Fig 3: Tenure-track Faculty (TTF) Sector

Assistant(t)=Assistant(t-dt)+(hiring_TTF-tenure-denial)*dt	(2)
INIT Assistant=22	(2.1)
hiring_TTF=past_TTF_growth+attrition*coverage_fr+estimated_TTF_growth	(2.2)
tenure=Assistant*tenure_ratio/t:review	(2.3)
denial=Assistant*(1-tenure_ratio)/t:review	(2.4)
attrition=denial+retirement	(2.5)
coverage_fr=0.8 {dimensionless: success at replacing faculty}	(2.6)
t:review=7 {years}	(2.7)
tenure_ratio=0.9 -(tenured_TTF/total_TTF)^3 {dimensionless}	(2.8)
tenured_TTF=Associate+Full	(2.9)
total_TTF=Full+Assistant+Associate	(2.10)
past_TTF_growth=GRAPH(TIME)	(2.11)
(1987,9.00),(1988,5.00),(1989,7.00),(1990,11.0),(1991,8.00),(1992,10.0),(1993,0)	
estimated_TTF_growth=GRAPH(TIME)	(2.12)
(1993,0),(1994,13.0),(1995,11.0),(1996,12.0),(1997,15.0)	
Associate(t)=Associate(t-dt)_(tenure-promotion)*dt	(3)
INIT Associate=19	(3.1)
promotion=(Associate/t:full)	(3.2)
t:full=7 {years}	(3.3)
Full(t)=Full(t-dt)+(promotion-retirement)*dt	(4)
INIT Full=12	(4.1)
retirement=Full/t:retirement	(4.2)
t:retirement=12 {years}	(4.3)

Worth noting in the structure of the TTF sector is equation (2.8), which model the tenure decision as a cubic transformation of the tenured to total tenure-track faculty ratio. The ratio's cubic transformation as well as the parameter of (2.8) was motivated by extensive discussions with B-school's chair of the personnel committee, who had been serving in the same position for at least eleven consecutive years. Tough job, but someone has to do it. Similarly, the dimensionless parameter of 0.8 in (2.6) resulted from extensive discussions but also debate in the deliberations of the ad-hoc committee. Representing success at replacing faculty, this parameter may be 1 for large schools with global reputation, but the high cost of living and crime can make it hard for a small B-school in New York to hire top-notch junior faculty. Lastly, while the 7-year probation periods in (2.7) and (3.3) are fairly standard in the life of TTF, the 12-year parameter in (4.3) is consistent with the mean age data of (Rees & Smith, 1991, pp.12-13).

Partial Model Test #2: The Tenure-track faculty (TTF) Sector

The graphical table functions in (2.11) and (2.12) also contain exogenous time-series input functions of time. Historical data up to 1992 were available from the school's records (2.11), while the Dean kindly shared personal TTF growth plans for the next five years (2.12). The data of Fig. 4(a) shows that in isolation-despite its rather intricate feedback-loop structure-the main chain infrastructure of Fig.3 reproduces the school's total TTF behaviour fairly accurately. Again, the small percentage error-less than 10%-computed and plotted in Fig4(b) helped in gaining the project participant's confidence in system dynamics modeling and simulation. The large U^M and U^S TIS values indicate possible bias between the simulated and actual series; perhaps even systematic error (Sterman, 1984, p55). Yet, should one look for bias and error in the model or in the P&T process?!?

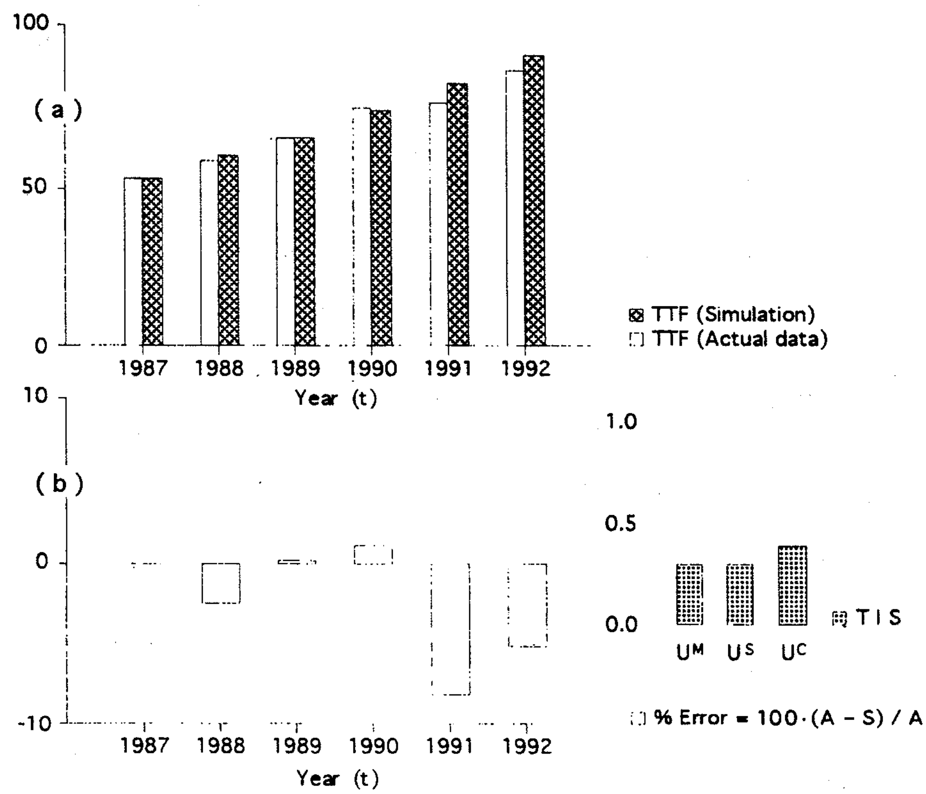

Fig 4:
(a) Total tenure-track faculty (TTF) simulation vs actual data, and
(b) Percentage (%) error and Theil Inequality Statistics (TIS)

Premise Description #3: The Adjunct Faculty (AF) Sector

Knowing how inflexible and uncompromising the process of promotion and tenure is, the American Association of Collegiate Schools of Business (AACSB) let B-schools use the adjunct faculty to supplement their personnel needs, particularly when unforseen changes occur in student enrollment. Fig 5 shows how the S-level 'ghost' haunts the administrative decision of hiring new AF members. Estimated AF growth - one of the terms affecting hiring decisions in equation (5.2), is itself a logarithmic function of the school's student population (5.5). The adjusted $R^2 = 0.857$ in (5.5) indicates that the logarithmic function could explain more than 85% of the variability historically observed in AF growth data. It is a rather impressive fit that validates using this mathematical function instead of graphical table function. The reason for doing so is that the 1992 actual AF data had not yet been compiled at the time of our intervention.

Fig. 5: Adjunct Faculty (AF) Sector

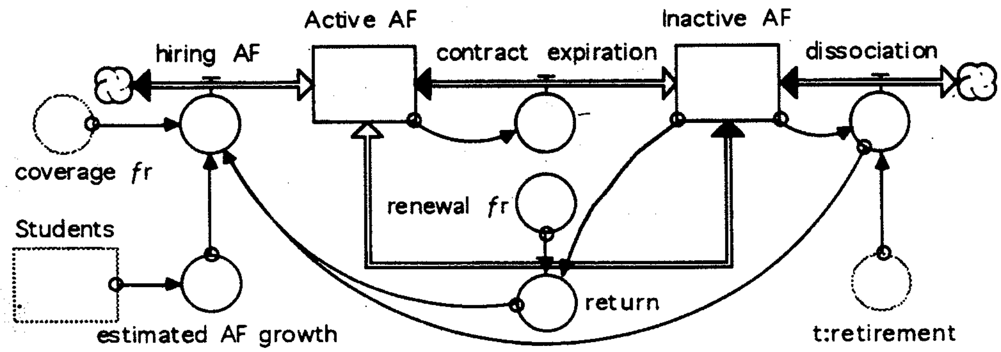

Fig 5: Adjunct Faculty (AF) Sector

Active_AF(t)=Active_AF(t-dt)+(hiring_AF+return-contract_expiration)*dt	(5)
INIT Active_AF=39	(5.1)
hiring_AF=estimated_AF_growth+dissociation*coverage_fr-return	(5.2)
return=Inactive_AF* (1-renewal_fr)	(5.3)
contract_expiration=Active_AF	(5.4)
estimated_AF_growth=-176.526+30.744*LOGN(Students) {R^2=0.857}	(5.5)
renewal_fr=2/3 {dimensionless}	(5.6)
Inactive_AF(t)=Inactive_AF(t-dt)+(contract_expiration-return-dissociation)*dt	(6)
INIT Inactive_AF=0	(6.1)
dissociation=Inactive_AF/t:retirement	(6.2)

At the end of each academic year AF contracts expire, rendering AF members inactive, in principle at least. Historically again, depending on course registration, roughly 2/3 of AF contracts are renewed unless, of course, adjunct faculty members in demand choose to dissociate themselves from the B-school, ie, they retire. That is precisely the information that the dimensionless 2/3 parameter in equation (5.6) conveys.

Partial Model Test #3: The Adjunct Faculty (AF) Sector

Once more, STELLA's "Sector Specs" command helped isolate the structure of the AF sector in Fig 5. Yet, also enabling the S sector of Fig 3 allowed accounting for the effect of students on AF hiring. This is perhaps the price we had to pay for using a statistically estimated mathematical function instead of a graphical table function. The lack of actual data for year 1992 at the time of our intervention limited the range of point-to-point comparisons we could make in reproducing the behaviour of active AF in this partial model test. Despite this limitation, however, the AF simulation versus the actual data of Fig 6(a) show that, with the student sector of Fig 1 active, the model structure of Fig 5 can reproduce the historically observed dynamic behaviour pattern of active adjunct faculty. The AF simulation data exhibit a smooth pattern, reflecting the smooth deterministic function in (5.5), which discounts the variability observed in the growth pattern of the actual AF data. Despite conceivable objections by the system dynamics purists, the small percentage - less than 10% - error and unsystematic error TIS values of Fig 6(b) helped in building the participant's confidence in the deterministic model.

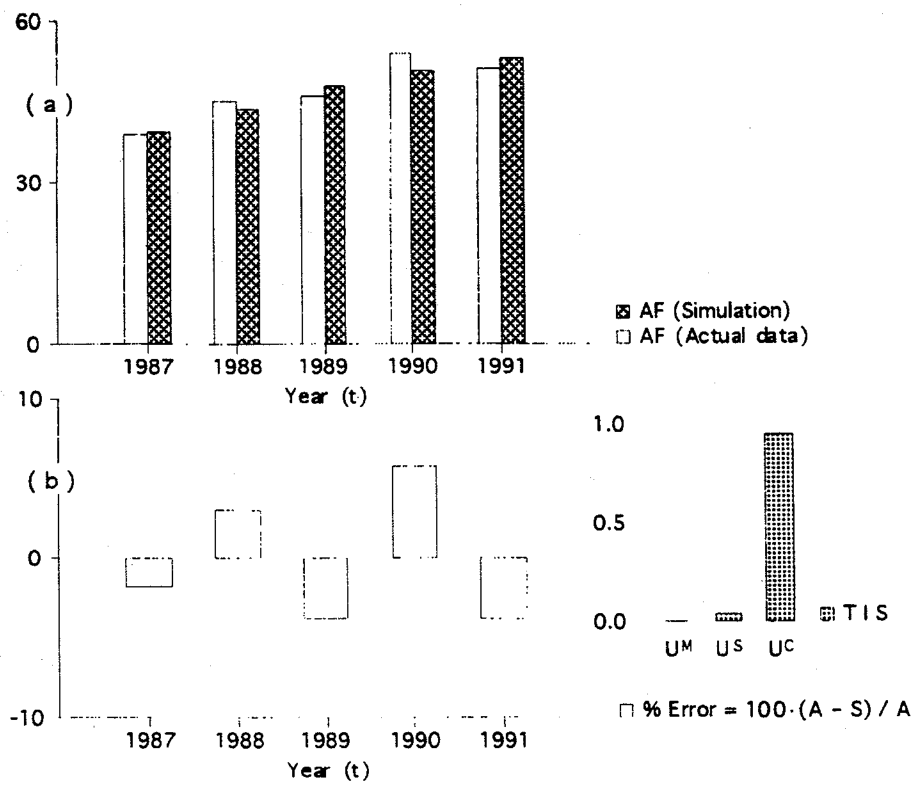

Fig 6:
(a) Active adjunct faculty (AF) simulation vs actual data, and
(b) Percentage (%) error and Theil Inequality Statistics (TIS)..

Premise Description #4: The Student / Faculty (S/F) Ratio Sector

Fig 7 shows the students per faculty ratio sector. Given AACSB's guidelines, the 2/3 parameter in (7) converts AF to their TTF equivalent. The S\TTF ratio in (8) entails a straightforward calculation, used with (7) in simulations of the entire model.

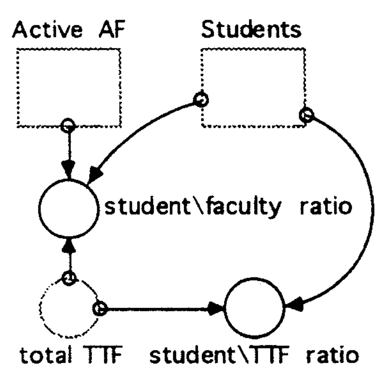

Fig 7:S/F Ratio Sector

student\faculty_ratio=Students/(total_TTF+(2/3)*Active_AF (7)
student\TTF_ratio=Students/total_TTF (8)

Simulation Results of the Entire Model

Following the scenario approach of Morecroft, in simulation experiments with the entire model, we examine how the intended rationality in hiring AF and TTF might hold up to an offer made to the B-school's Dean for the presidency of a university. With the Dean's decision pending, the immediate implication of a headless B-school is a freeze in the estimated TTF growth of the TTF sector (Fig 2). Another source of uncertainty entails tilting the S growth fraction of Fig 1. With all 4 sectors active, values of the S growth fr = 0.75, 1, 1.25 in (1.3) imply changes in student growth from low to normal, to high, while subtracting the estimated TTF growth form the hiring TTF decision in (2.2) freezes the Dean's personal TTF growth plans for the next five years (2.12). Fig 8 shows the entire model's resulting behaviour.

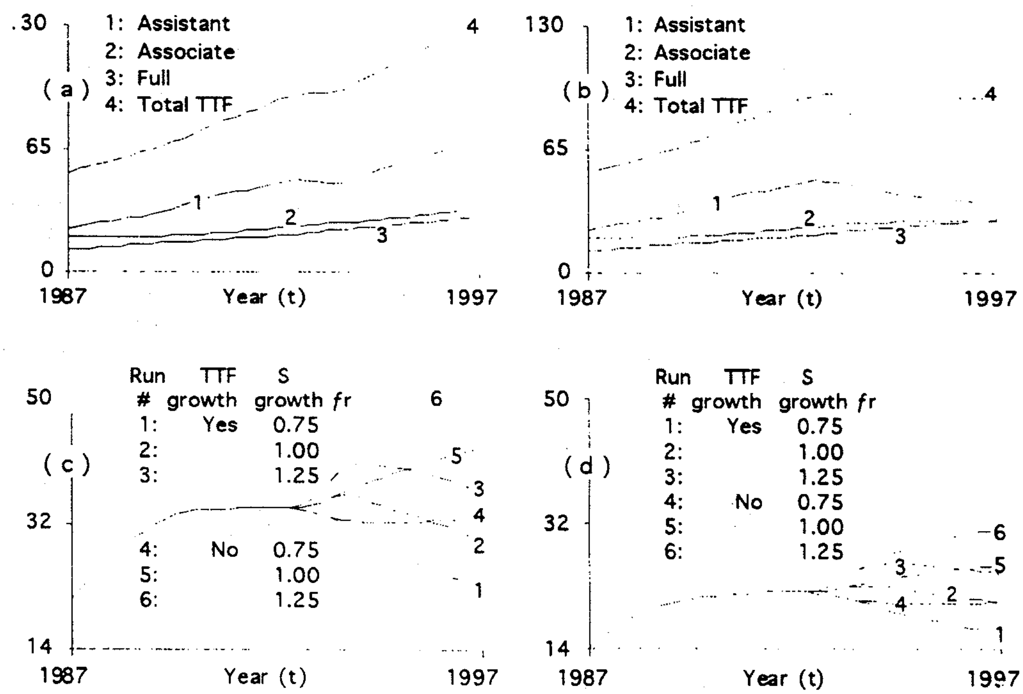

Fig 8:
(a) Tenure-track Faculty (TTF) with estimated growth activated in 1993.
(b) Tenure-track Faculty (TTF) without growth after 1993.
(c) Sensitivity of the student/TTF ratio to student (S) and TTF growth.
(d) Sensitivity of the student/faculty ratio to student (S) and TTF growth.

If the Dean respectfully declines the presidency offer, the total TTF growth of Fig. 8(a) may continue for the next five years, eventually causing the S/TTF ratio of Fig. 8(c) and the S/faculty ratio of Fig. 8(d) to decline too. The magnitude of the decline in these ratios will depend on how the student growth pattern evolves in the next five years: the less the student growth, the sharper the decrease. Conversely, if the Dean departs, the total TTF growth of Fig. 8(b) may turn negative, eventually causing the S/TTF ratio of Fig. 8(c) and the S/faculty ratio of Fig 8(d) to depart too. Again, the magnitude of the ratio departure will depend on how the student growth pattern evolves: the higher the student growth, the sharper the ratio increase by 1997.

Pressured by a growing student population, the area chairs of discipline oriented functions may intensify their recruiting effort, but the budget and TTF *line* freeze triggered by the Dean's departure will also increase the S/TTF ratio. Confirming the inexorable nature of the P&T process, the downward adjustment of TTF lines keeps pressuring associate and full professors to turn tenure applications down, further depleting the TTF pool. The limited success at replacing

TTF could cause a complete breakdown in the rationality of implementing AACSB accreditation standards pertinent to students per faculty ratios.

Conclusion

In the late '60s , the prospect of managing business schools seemed as promising as trying to mix oil and water which, "Left to themselves, [they] will separate again" (Simon, 1967, p.16). Assuming that all concerned know and act according to AACSB guidelines may increase the likelihood of being caught in a student growth and tenure denial trap. The computed scenarios show how the S/TTF and S/faculty ratios respond differently to changes in student enrollment and faculty growth. Some committee members found this transparent outcome... "fascinating." One implication is to consider both ratios in making hiring and P&T decisions for the B-school to attain accreditation. To close with a discipline oriented note, although supplementary to structure and parameter verification, combined with premise description and partial model testing, behaviour-reproduction tests with TIS can definitely help system dynamicists gain the confidence of project participants in system dynamics, particularly when caught in refutationism camps.

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