Using Student Classification Specific Applications and Admissions Data to Forecast Enrollment

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Presented at AIR 2004
June 2, 2004
Our Purposes/Objectives

1. Discuss the assumptions and procedures to forecast enrollment.

2. Discuss some of the technical and contextual issues involved.

3. Discuss the use of the forecasts to establish applications and admissions targets that will keep student characteristics aligned with the strategic intentions of the university.

4. Discuss the use of forecasting as a targeting and policy tool for social action and for organizing the work of the university.
“Predictions are best made in a stable system where trends are well established and rates of change for all variables are known. It is even better if that stable system is nested in a stable environment.”

FAT CHANCE
“The farther away the projected time is from the present the more likely the projection will err by some degree. This is especially so when the environment is turbulent, the prediction involves many variables, and/or the system is undergoing continuous change.”

FAT CHANCE
FAT CHANCE’S DIMENSIONS OF CHANGE

The Sources of Change: “Internal” – “External”

The Duration of Change: Short to Long

Magnitude of Change: Small to Large

Frequency of Change: Single or Multiple

The Intensity of Change

The degree of Connectivity of Changes

The Threshold Where the Change makes a difference

Impact of Change (e.g., immediate or delayed)

And of course the

System’s Response to Change
\[ E = I + (C - O) \]

Where \( I = \) INPUT STREAMS
(First Time In College, Transfers, Non-degree Seeking Graduate Students, Masters Students and Doctoral Students)

Where \( C = \) Continuing Students

Where \( O = \) OUTPUT STREAMS
(Graduates, Drop-outs, Stop-outs, Transfers)
Three “Simple” Steps

1. Accurately estimate the Number of Continuing Students (C)
2. Estimate “Output and Loss” (O)
3. Accurately estimate the Number of New Students (I)

With enough lead time to allow organizational adaptations should they be needed.
FOCUS: CONTINUING STUDENTS

1. Establish if persistence is a stable element or if there have been changes in persistence. In the illustration below, fall-to-fall and spring-to-fall persistence have been steadily climbing. Note also that the 7 Year Average difference between Fall-to-Fall and Spring-to-Fall is 4.37 percent. For the last three time periods, the difference is 4.5 percent.

2. Establish the appropriate data unit(s). For some institutions, that have active spring new enrollments and or staggered degree programs, spring-to-fall may provide a better measure of persistence.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Persistence</td>
<td>53.4%</td>
<td>55.3%</td>
<td>55.1%</td>
<td>56.4%</td>
<td>58.9%</td>
<td>59.8%</td>
<td>60.8%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spring-to-Fall</th>
<th>1998</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Persistence</td>
<td>59.7%</td>
<td>60.4%</td>
<td>59.2%</td>
<td>58.0%</td>
<td>63.3%</td>
<td>64.6%</td>
<td>65.1%</td>
</tr>
</tbody>
</table>
FOCUS: NEW STUDENTS

1. Establish Trends and/or Changes in Matriculation Rates (Admitted to Enrolled) for entering students by classification. Note that for some university’s the only meaningful classifications are freshmen and graduate students.

2. The illustration below provides 6 years of data on the percent of admitted students by classification that actually enrolled. E.g., 49% of the admitted freshmen in fall 2003, actually enrolled.

<table>
<thead>
<tr>
<th>Fall Semester</th>
<th>1998</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshman</td>
<td>0.5</td>
<td>0.5</td>
<td>0.53</td>
<td>0.55</td>
<td>0.45</td>
<td>0.49</td>
</tr>
<tr>
<td>Sophomore</td>
<td>0.65</td>
<td>0.62</td>
<td>0.66</td>
<td>0.66</td>
<td>0.60</td>
<td>0.57</td>
</tr>
<tr>
<td>Junior</td>
<td>0.66</td>
<td>0.65</td>
<td>0.66</td>
<td>0.66</td>
<td>0.62</td>
<td>0.84</td>
</tr>
<tr>
<td>Senior</td>
<td>0.67</td>
<td>0.66</td>
<td>0.67</td>
<td>0.67</td>
<td>0.59</td>
<td>0.72</td>
</tr>
<tr>
<td>Post-Bac. Non</td>
<td>0.68</td>
<td>0.66</td>
<td>0.65</td>
<td>0.68</td>
<td>0.65</td>
<td>0.81</td>
</tr>
<tr>
<td>Masters</td>
<td>0.52</td>
<td>0.54</td>
<td>0.52</td>
<td>0.52</td>
<td>0.50</td>
<td>0.55</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>0.42</td>
<td>0.43</td>
<td>0.42</td>
<td>0.42</td>
<td>0.42</td>
<td>0.45</td>
</tr>
</tbody>
</table>

The next slide shows the input streams for fall 2003
## Focus on New Students: Establish Input Streams

### Fall 2003 Streams

<table>
<thead>
<tr>
<th>Fall 2003</th>
<th>New Applications</th>
<th>Admitted</th>
<th>Number Applied who Enrolled</th>
<th>Percent Applied</th>
<th>Percent of Applied who were Admitted</th>
<th>Percent of Admitted Who Enrolled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshmen</td>
<td>5,402</td>
<td>2,348</td>
<td>1,151</td>
<td>100%</td>
<td>43%</td>
<td>49%</td>
</tr>
<tr>
<td>Sophomore</td>
<td>1,293</td>
<td>835</td>
<td>472</td>
<td>100%</td>
<td>65%</td>
<td>57%</td>
</tr>
<tr>
<td>Junior</td>
<td>1,368</td>
<td>970</td>
<td>819</td>
<td>100%</td>
<td>71%</td>
<td>84%</td>
</tr>
<tr>
<td>Senior</td>
<td>456</td>
<td>267</td>
<td>192</td>
<td>100%</td>
<td>59%</td>
<td>72%</td>
</tr>
<tr>
<td>Grad. Non-Degree Seeking</td>
<td>678</td>
<td>532</td>
<td>430</td>
<td>100%</td>
<td>78%</td>
<td>81%</td>
</tr>
<tr>
<td>Terminal Masters (e.g., MBA)</td>
<td>2,884</td>
<td>1,810</td>
<td>1,033</td>
<td>100%</td>
<td>63%</td>
<td>57%</td>
</tr>
<tr>
<td>Masters</td>
<td>224</td>
<td>122</td>
<td>63</td>
<td>100%</td>
<td>54%</td>
<td>52%</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>957</td>
<td>466</td>
<td>209</td>
<td>100%</td>
<td>49%</td>
<td>45%</td>
</tr>
</tbody>
</table>
Percent of Total New Student Applications of who enrolled Fall 2003 by Classification.

N= 4,369 new student enrollees

Transfer pools from other 4-yr. institutions and Community colleges.
ESTABLISH THE PERIODICITY OF APPLICATIONS
(as a means to staff and regulate work flow)

Applications by Student Classification for Fall 2002

Continue to new slide
THE PERIODICITY OF APPLICATIONS
(as a means to staff and regulate work flow)

Applications by Student Classification for Fall 2002

Note that applications-by-date for each student classification has its own pattern. These patterns are quite consistent over time. For example, Junior transfers peak in two areas—after the fall semester ends and near the end of the spring semester. These patterns can be anticipated to manage office workflow, and processing.
Before smoothing, the daily data appears quite noisy. The next slide shows this data smoothed by month.
ESTABLISH RELATIVE STABILITY
Focusing on Incoming Freshmen
and Fall 2004 to April 2004, by Date of Application

Note the consistency in the peaks

In this case, variations in amplitude are due to modifications in recruitment Strategy.
Establish Cumulative Application Trends
Focusing on Incoming Freshmen

Freshmen Applications for Fall Semesters 2001 to 2003
and Estimated for Fall 2004

These cumulative trend lines will be used to construct an applications-admissions-enrollment target, and a forecasting line. See next slide
This chart represents: a need for 6,213 applications to achieve 1,300 enrolled new freshmen based on the assumption that the 6,213 applications will yield 21% actual enrollment of freshmen with the student characteristics desired by the university (6,213 x .21 = 1304). Continue to next slide for more information.
Application Targets Based on Prediction Line and a Target Enrollment of 1,300 based on a matriculation rate of 21% for Freshmen for Fall 2004

This chart also represents a means to track the application process to measure whether or not recruitment efforts are meeting, lagging or exceeding time relevant targets. The chart will be used to create a forecasting on the next slide. Continue to next slide for more information.
1. The forecasting line SHOULD attempt account for INTERNAL changes in recruitment practices. This is easier said than done!
2. An accepted method for smoothing minor alterations in processes is to use a weighted average to establish the prediction lines and transitional probabilities.
3. By monitoring activity patterns in the recruitment area, we can contextually establish “weights” for the variables in the average.
4. The weighted average plus the performance target enrollment, assuming constant applications-admissions-matriculation probabilities, yields a prediction line for applications needed.
5. In the next slide, the forecasting line is based on a weighted average of fall 2002 at .33 and fall 2003 at .66. This is based on what we know about recruitment practices, scholarship packages, etc…
Fall 2004 Prediction Line with State Multipliers Based on a Weighted Average Model:
\[ \frac{F_{02} + 2(F_{03})}{3} \]

Application Targets Based on Prediction Line and a Target Enrollment of 1,300 based on a matriculation rate of 21% for Freshmen for Fall 2004
Fall 2004 Prediction Line with State Multipliers Based on a Weighted Average Model:

\[
\frac{F02 + 2(F03)}{3}
\]

\[
\sum A^f = (a^{t1,2,...,n})(m^{t1,2,...,n})
\]

Where \( A^f \) = total applications; \( a \) = applications at time 1…n, and \( m \) = state multiplier at time 1…n
Here we see how the real data for past semesters and the prediction line coincide.
The Forecasting line again

Fall 2004 Prediction Line with State Multipliers Based on a Weighted Average Model:

$$\frac{F_{02} + 2(F_{03})}{3}$$

State Multipliers

$$\sum A^f = (a^{t1,2,...n})(m^{t1,2,...n})$$

Where $A^f =$ total applications; $a =$ applications at time $1...n$, and $m =$ state multiplier at time $1...n$
Establish Cumulative Application Trends and Performance Targets
Focusing on Incoming Freshmen
Freshmen Applications for Fall Semesters 2001 to 2003 and Estimated for Fall 2004

Use of the forecasting line to establish targets
Anticipating and Accounting for Variations in Matriculation Rates

The following slide shows the number of needed applications based on a change in the assumed rate of matriculation.

If, for example, as a result of a tuition increase the rate of matriculation declines from 21% to 20%, an additional 219 applications will be needed to meet the goals of 1,300 new, enrolled freshmen.

On the other hand, if, for example, newly instituted financial aid programs and enhanced aid packages, raise matriculation to say 30%, a lower target can be established.

In general, matriculation rates vary by classes of institutions—from highly selective to open admissions— but for any institution, a forecasted rate can be established based on historical data and altered based on local knowledge.

SEE NEXT SLIDE.
Application Targets Based on Prediction Line and a Target Enrollment of 1,300 Freshmen for Fall 2004 Assuming Constant Admissions Rate (43%) and Variable Matriculation Rate

If the assumed matriculation rate is 20% (perhaps due to increases in tuition), the number of applications needed, jumps from 6,213 to 6,432. If for example, because of increases in student aid, the matriculation rate is 30%, the number of applications needed is reduced to 4,350. The point is that one must understand the contextual issues underlying yields in any academic year.
The Procedures we have been describing can be used on other student application categories. Below are charts of Junior applications.
Cumulative Junior Applications For Fall Semesters 2001, 2002 and 2003
Cumulative Junior Applications For Fall Semesters 2001, 2002, 2003 and F04 Target

The graph shows the cumulative number of junior applications for fall semesters from 2001 to 2004. The y-axis represents the number of applications, ranging from 0 to 1600, while the x-axis represents time from October of the previous year to October of the current year. The graph includes four lines, each representing different years (F01 to F04), with distinguished markers indicating specific application counts at various points in time.
The Procedures we have been describing can be used on other student application categories. Below are charts for Masters applications.

**Forecast Line For F04 Masters Applications**

![Forecast Line For F04 Masters Applications](image-url)
This slide shows the prediction lines for 5 student classifications at their individual “take-off” points and their “convergence” points.
Does it work?

Predicted Versus Actual Enrollment for Fall Semesters 1998-2003

Fall Semester

- 1998: Predicted Feb/March 9,497
- 1999: Predicted Feb/March 9,846
- 2000: Predicted Feb/March 10,717
- 2001: Predicted Feb/March 12,155
- 2002: Predicted Feb/March 12,988
- 2003: Predicted Feb/March 13,687

- 1998: Predicted July 9,278
- 1999: Predicted July 10,176
- 2000: Predicted July 10,837
- 2001: Predicted July 12,623
- 2002: Predicted July 13,083
- 2003: Predicted July 13,800

- 1998: Actual Enrollment 9,518
- 1999: Actual Enrollment 10,101
- 2000: Actual Enrollment 10,945
- 2001: Actual Enrollment 12,455
- 2002: Actual Enrollment 13,229
- 2003: Actual Enrollment 13,725
The Top Ten Areas Account for 65% of all Applications and 32% of the New Fall Semester Enrollees

Application to Enrollment Sequences for Top Ten Majors listed by Applicants, Fall 2003

One can use the same procedures to establish target for specific areas.
Three “Simple” Steps

1. Accurately estimate the Number of Continuing Students (C)
2. Estimate “Output and Loss” (O)
3. Accurately estimate the Number of New Students (I)

With enough lead time to allow organizational adaptations should they be needed.
\[ E = I + (C - O) \]

1. Establish if persistence is a stable element or if there have been changes in persistence; establish the best data unit for estimation (fall-spring).

2. Establish Trends and/or Changes in Matriculation Rates.

3. Establish Input Streams, their periodicity and relative stability.

4. Account for internal changes in recruitment and retention strategies.

5. Establish Cumulative Application Trends. Smooth when appropriate.

6. Set Performance Targets. Create alternative targets based on differing assumptions about persistence, admissions, and rates of matriculation. Monitor the capacity of key majors.