Change
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Improving Advising Using Technology and Data Analytics

by Elizabeth D. Phillips

Traditionally, the collegiate advising system provides each student with a personal academic advisor who designs a pathway to the degree for that student in face-to-face meetings. Ideally, this is a supportive mentoring relationship. But in truth, this system is highly inefficient, error prone, expensive, and a source of ubiquitous student dissatisfaction.

This article describes a method that enhances human advising with modern technology and data analytics, thereby freeing advisors to spend more time on the things only people can do. This method, called eAdvisor, helps students find majors in which they are likely to succeed; keeps them progressing toward a degree; and makes advisors more informed, efficient, and effective. It also allows the university to manage enrollments effectively, thereby saving money while improving student success.

EAdvisor

The National Academic Advising Association (NACADA) describes the ideal human advising program focused on the interaction between individual students and their advisors in the following terms:

- Academic advising conferences must be available to students each academic term.
- Academic advisors should offer conferences in a format that is convenient to the student, i.e., in person, by telephone, or online. Advising conferences may be carried out individually or in groups.
- Academic advising caseloads must be consistent with the time required for the effective performance of this activity.
- The academic status of the student being advised should be taken into consideration when determining caseloads. For example, first year, undecided, under-prepared, and honors students may require more advising time than upper-division students who have declared their majors. (NACADA, 2011)

Early in the 21st century, most universities—including Arizona State University (ASU)—had advising systems that followed these guidelines. As was typical at comparable institutions, the university's academic advisors handled students in the majors and those in University College (a lower-division unit that counsels undecided students and those who wish to change majors). Every student had to see an advisor each semester in order to register for classes.

Most programs at ASU admit majors in the junior year. Prior to the advent of eAdvisor, students used their freshman and sophomore years either searching for a major or enrolled in a pre-major sequence (e.g., pre-business, pre-architecture) in which they acquired the credentials required for admission to the program of their choice.

With this system, students often did not know until the end of their sophomore year whether they had sufficiently high grades to gain admittance to the major. Failing to achieve the appropriate level of performance for a given major by the end of the sophomore year, they were forced to seek another that might have significantly different prerequisites, re-enter an

exploratory mode, or transfer to another institution.

Students, faculty, and advisors all recognized the complexity and ineffectiveness of this system, but alternatives to this hand-crafted process proved difficult to design. However, the recently developed ability to capture many aspects of the student experience in computer-accessible databases permits a much more systematic approach to managing a student's path through the complex and rich curricular offerings of any major university.

Today many institutions have versions of online course planning for students and advisors. One of those systems, developed at the University of Florida at the end of the 1990s, served as a prototype for the much more comprehensive system implemented at ASU: eAdvisor.

The tools developed at ASU accommodate a wide range of curricular alternatives, paths through the curriculum, and student experiences and preparation. The analytical framework not only allows advisors to chart a path for each student, but it enables the university to offer courses (with the necessary seats) that students must have in order to complete a major on time.

Recent developments in computer technology and data-mining techniques permit a systematic analysis of student success patterns over substantial populations of diverse students. This allows for the development of criteria predictive of student success in each major. With these criteria available, the computer can match the performance of any individual student to the anticipated success patterns.

When transfer students are on a path to a degree, the comprehensive nature of the database also permits advisors to quickly determine which of the courses they have already taken will count toward that degree and what additional ones they need to take. This same technique supports students who change majors, for it remaps all their previous work against the requirements for the new degree and then outlines the optimal path to achieve that degree.

Advisors and students can quickly review many degree alternatives to identify those that meet the student's goals with the least investment of time and money in additional requirements. In prior years, these tasks required advisors to look up degree requirements in catalogs, make out paper scheduling sheets, and review transcripts. Few alternatives could be explored in the time available; moreover, the paper system was error prone. EAdvisor eliminates this work and frees the advisor and student to focus on the criteria for success.

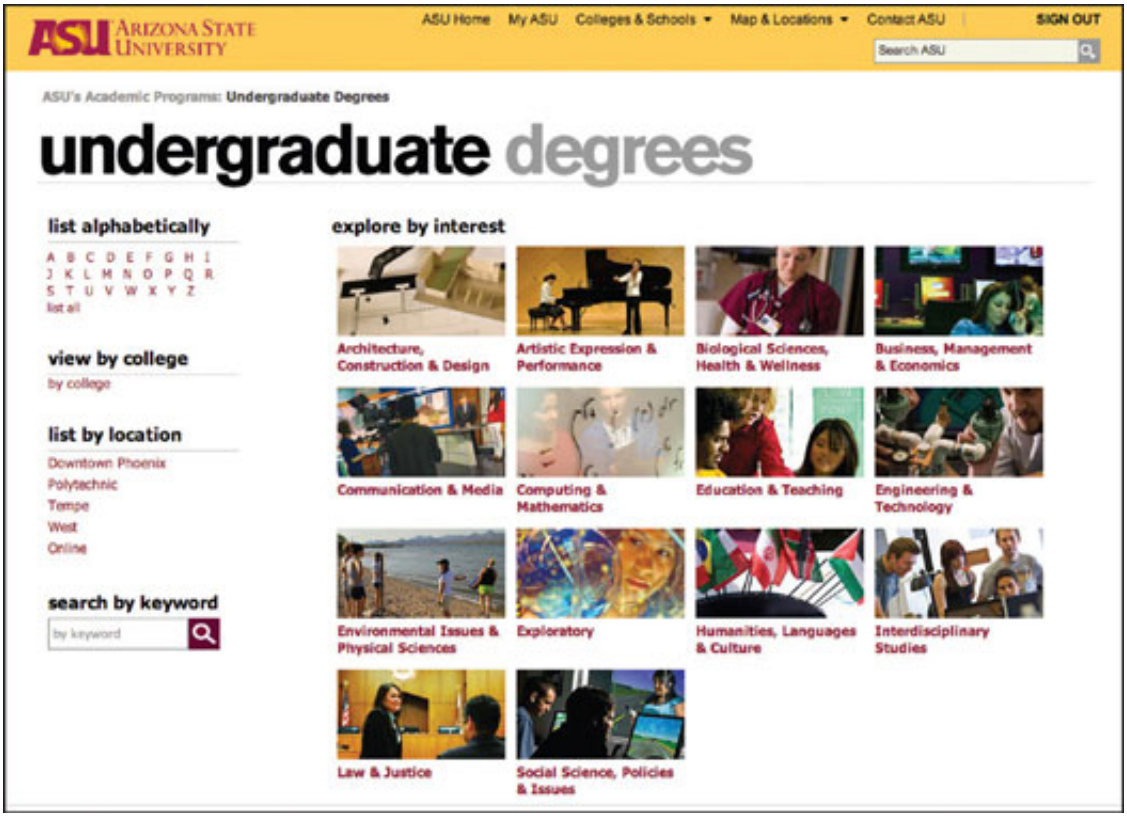
EAdvisor, while developed for the particular circumstances of ASU, is nonetheless a general-purpose design adaptable to almost any large comprehensive and diverse academic institution. What follows are the details of its operation.

Choosing a Major

Students find the rich but complex curricular offerings of large public universities difficult to understand, and the process of choosing a major often becomes a haphazard affair based on limited information. Universities often list their majors alphabetically in a catalog (online or paper) and group the requirements for the degree under each major. But it is a rare student who actually reads the catalog from cover to cover. This is a daunting task at large research institutions; ASU, for instance, has more than 250 different majors.

Students frequently come to the university with a major in mind, chosen based on information from high school counselors, parents, or friends—or sometimes on a vague notion of what its name implies. Others take a variety of courses to explore different fields of study. As a practical matter, though, no student can explore 250 different majors without some guidance. Students need to be focused on understanding the ones that are of the most interest to them and in which their previous preparation and skills position them to succeed.

To improve on this initial encounter with the university's rich academic offerings, the eAdvisor system allows students to search for a major via a computer application named Degree Search. The application is student friendly, in that it follows the patterns of the Internet search engines and permits keyword queries (Figure 1).



Caption: Figure 1

For example, a student may enter “interested in people,” and all majors relevant to this interest appear on the screen, along with their requirements. Students can save their searches and compare one degree's requirements to another's. They can explore degrees online whenever they want and wherever they are, and they need not involve an advisor until they have narrowed their search.

Students do best when their work has an academic direction and structure. The eAdvisor system now requires students to choose a major upon entry to ASU. Degree Search not only supports current students but also allows prospective ones to explore possibilities. For example, students at the community colleges in Arizona can use the application, and eAdvisor shows how their current community college courses will fit into the degree requirements of any ASU degree.

Many students, of course, do not know what major they want, so they need to explore before making a choice. The university offers five exploratory majors—arts and humanities, science and engineering, social science, health, and business. Most students can make a choice among these and start exploring in a focused way within the chosen domain.

Students can stay in an exploratory major for 45 credits without impeding their progress toward a degree, which provides them with an academic home. While social clubs and other extramural activities contribute to a sense of belonging and community, the university's primary activity is academic. The earlier students have an academic home, the greater the chances of their success.

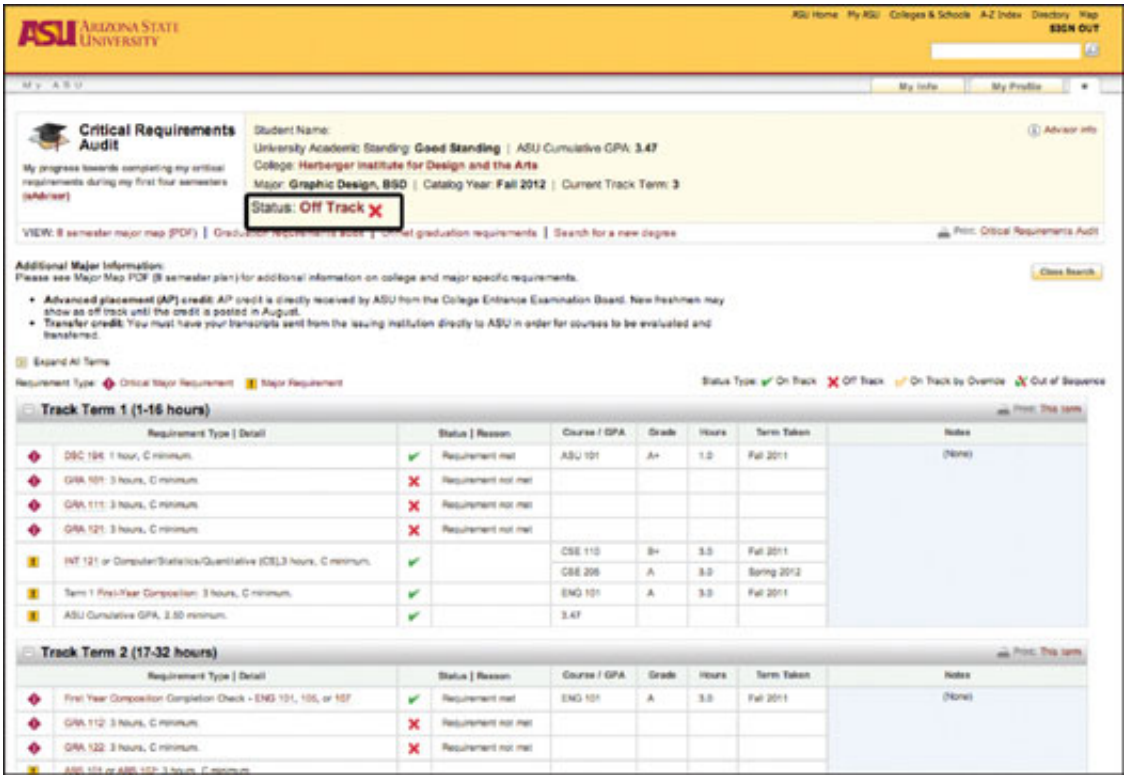
Choosing Courses

Although the choice of a major creates the primary organizing structure for the student's degree, success is often dependent on the student's taking the right courses in the right sequence. EAdvisor has tools to support both advisors and students in scheduling courses in the most effective pattern.

Before the advent of the eAdvisor system, students would meet with an assigned staff advisor who would help them choose courses and register in classes. But no human advisor could keep track of all the curricular possibilities, know about the

constant changes that occur as courses are introduced into and eliminated from the catalog, or identify out of all the possible course choices the ones that would be the straightest path to a degree. So this inefficient system produced significant errors. The eAdvisor system, on the other hand, can always be up to date and accurately match the courses to the requirements for each student.

Requirements for each major and for general education, as well as course schedules, reside within the database, as do the transcripts and the courses each student is currently taking. To produce this system, the departments described the sequences of courses required for each major and identified the ones that are critical in diagnosing who is unlikely to succeed in that major (Figure 2). If, for example, a student who has nursing as a major struggles to earn a “C” in anatomy and physiology or an aspiring engineer does badly in calculus, chemistry, or physics, the system will flag that individual for additional academic support and offer advice on choosing a different program.



Caption: Figure 2

And eAdvisor identifies the best course sequence, not just the allowable one. Critical requirements must be taken early because of their diagnostic power. It is better for students to discover this and find a field that is better matched to their skills and preparedness as soon as possible.

Sometimes parents will choose a major for their children, but the students, uninterested in that field, take courses that interest them more. EAdvisor requires that the courses taken match the chosen major. If students want to study subjects that are unrelated to their majors, the system makes them confront the conflict. If a student's performance does not predict success, the advisor, using the system, can identify other courses of study for which the individual is better suited, based on the experience of many other students.

One of the key advantages of analytical depth applied to the rich dataset is the ability to follow students from day one, identifying successful work toward a desired degree or flagging problems that require intervention by advisors or other academic support personnel. EAdvisor operates in real time, constantly updating information, ensuring that each student's record matches the criteria for success, and alerting advisors that students need personal attention exactly when they need it. So rather than waiting for a cumulative judgment at the end of their sophomore year, students continuously know whether they are on their way to success in their chosen major or whether they should reevaluate their goals.

The computer frees advisors from the technical management of curricular details, for which the computer is especially well adapted. This focuses their time on individual counseling and interpretation, which takes advantage of their judgment and experience.

Academic advising requires empathy as well as academic expertise, and the tendency is assume that the advisors are the ones to tell students that their dreams of becoming a biologist or dancer are not practical because their grades in the critical courses are too low. But many advisors find this hard to do. Because the impersonal eAdvisor has identified the difficulty and both the advisor and the student receive the same message and information, their conversation is about not about failure but about improving the student's chances of success.

The university does expect progress toward a degree. When that progress falters, both student and advisor must meet to consider eAdvisor's recommendation of what is required to get back on track. This warning forces everyone (the student, the advisor, and any other people in the university's support system whose help may be needed) to pay attention to the student's issues.

But while the eAdvisor system provides a strong analytical and data-based reference to help advisors point out students' optimal choices, it does not force the advisors to make any particular decisions. There is a requirement built in that a student who is off track twice must change majors. But advisors can allow their advisees to continue in a major if there is good reason for their being off track—financial trouble, a death in the family, or other personal issue—rather than a mismatch of talents to the major.

Advisor Tools

Online tools and reports enable advisors to monitor the progress of each student assigned to them and to focus their attention on those who require help. In this way, they can effectively support a large number of advisees (the average for each academic advisor at ASU is 350).

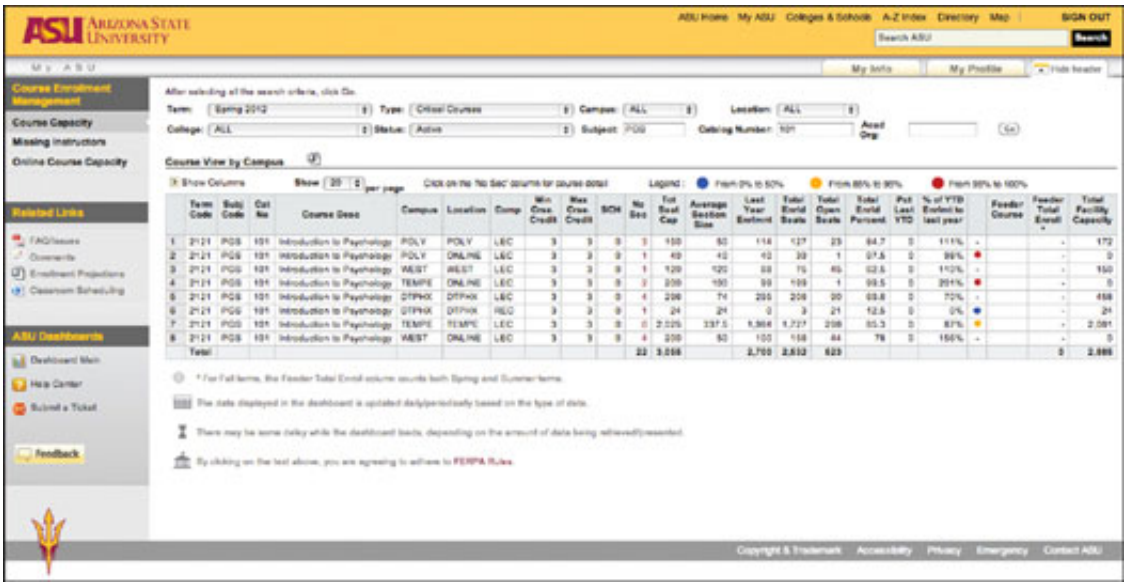
Scheduling Courses

Large complex universities have a seemingly endless variety of courses, requirements, and majors that change as the fields of knowledge evolve. So the process of delivering the right courses in the right sequence and at the right time and place to the students who need them presents a significant challenge. The tools in the eAdvisor system solve this challenge by combining data from multiple sources to drive course scheduling.

The system has complete information on every student's major, courses completed, and courses needed. It knows which courses will be required for the next semester for all students, as well as which of these are critical and must be provided on time. That enables the university to work with the departments and programs to ensure the availability of classes the students have to have.

It also calculates how many seats are needed the next semester in every critical course. By using classroom-scheduling software to produce exactly the seats required, the university saves a significant amount of money. At the same time, guaranteeing seats in required classes enables students to progress towards graduation and thus increases their satisfaction.

Before ASU had these tools, departments and programs added sections during registration when it appeared they would be needed, producing a scramble to find instructors at the last minute. Now, they are informed of how many seats to provide prior to scheduling so that they can staff the courses properly (Figure 3). Once a department meets students' critical needs, it can offer courses that serve other needs or electives.



Caption: Figure 3

This system, combined with increased placement precision and the social support and tutoring discussed below, has led to an increase in the freshman to sophomore retention rate, which has gone from 76 percent to 84 percent in the last five years. Each percentage point increase in retention generates approximately $1.7 million in recurring increased revenue for ASU, while greatly increasing the likelihood that those retained students will graduate. The four-year graduation rate increased from 32 percent for the fall 2005 cohort (pre-eAdvisor) to 42 percent for the most recent cohort (fall 2008).

Monitoring Programs, Students, and Advisors

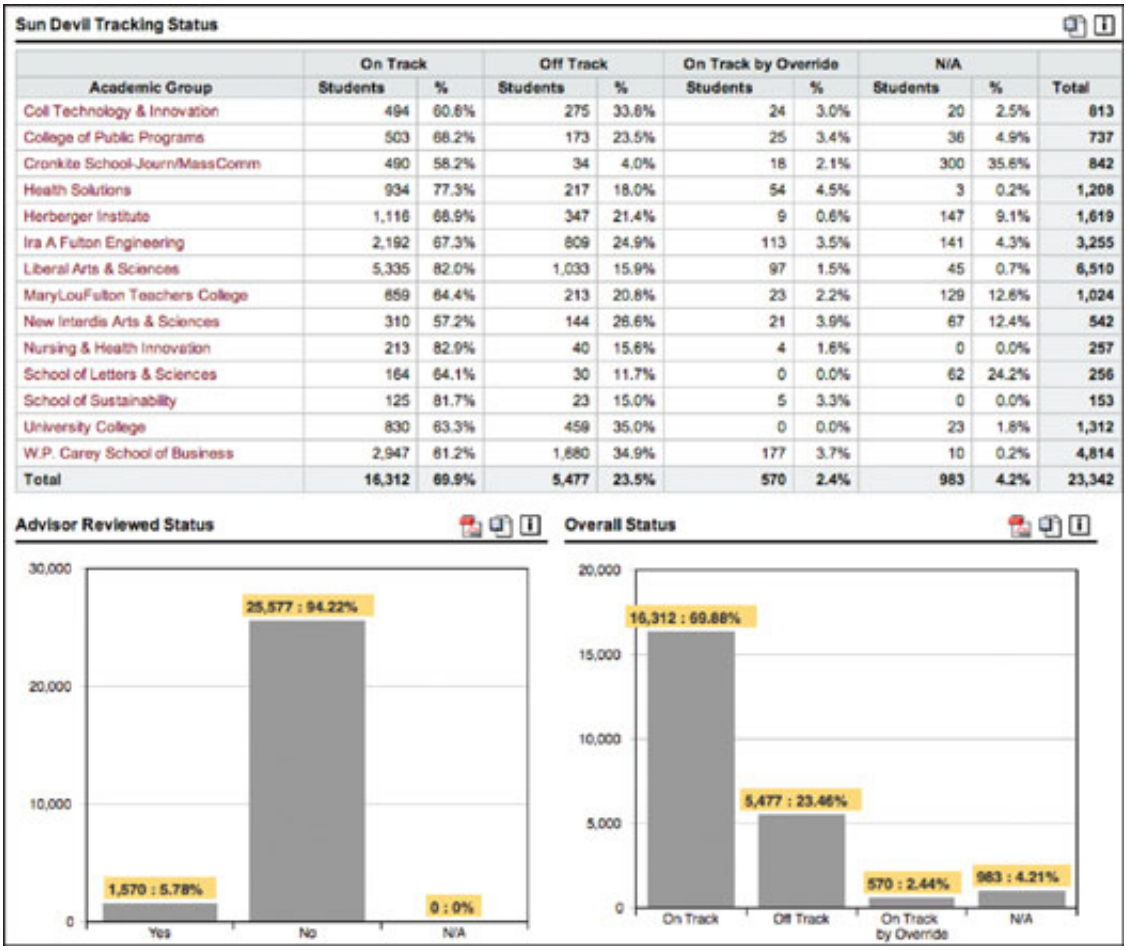
While the principal value of eAdvisor and its database is to support student success, it has some other administrative uses. By putting the curriculum in electronic format, the institution can easily analyze degrees and their requirements. Prior to instituting electronic "major maps," as they are called, the questions below were answered via a time-consuming, error-prone process.

A simple data run will identify whether

- each academic degree or certificate program has the correct number of hours,
- the course titles and credits are listed in the course schedule,
- required courses have numbers and have been approved,
- the degree program satisfies the university's general studies requirements,
- the right number of upper-division courses is required in each degree program,
- a degree program requires a course that is being considered for elimination,
- a degree program requires upper-division courses in the first four semesters,
- critical requirements are offered as frequently as needed, and
- something has changed in degree programs since the previous year.

When discrepancies are identified, the responsible departments can quickly fix them.

The eAdvisor tools also allow the university to monitor the work of the academic advisors. Any system can be subverted by poor implementation, so it is important to assess the quality of advising, as well as find any problems with the eAdvisor system that affects that quality. By reviewing the actions of advisors, such as reporting how many students are off track and why or how many overrides they give and for what reasons, the university can identify performance issues, improve the system, and improve advisor consistency (Figure 4).



Sun Devil Tracking Status

	On Track		Off Track		On Track by Override		N/A		
Academic Group	Students	%	Students	%	Students	%	Students	%	Total
Coll Technology & Innovation	494	60.8%	275	33.8%	24	3.0%	20	2.5%	813
College of Public Programs	503	68.2%	173	23.5%	25	3.4%	36	4.9%	737
Cronkite School-Journ/MassComm	490	58.2%	34	4.0%	18	2.1%	300	35.6%	842
Health Solutions	934	77.3%	217	18.0%	54	4.5%	3	0.2%	1,208
Herberger Institute	1,116	68.9%	347	21.4%	9	0.6%	147	9.1%	1,619
Ira A Fulton Engineering	2,192	67.3%	809	24.9%	113	3.5%	141	4.3%	3,255
Liberal Arts & Sciences	5,335	82.0%	1,033	15.9%	97	1.5%	45	0.7%	6,510
MaryLouFulton Teachers College	659	64.4%	213	20.8%	23	2.2%	129	12.6%	1,024
New Interdis Arts & Sciences	310	57.2%	144	26.6%	21	3.9%	67	12.4%	542
Nursing & Health Innovation	213	82.9%	40	15.6%	4	1.6%	0	0.0%	257
School of Letters & Sciences	164	64.1%	30	11.7%	0	0.0%	62	24.2%	256
School of Sustainability	125	81.7%	23	15.0%	5	3.3%	0	0.0%	153
University College	830	63.3%	459	35.0%	0	0.0%	23	1.8%	1,312
W.P. Carey School of Business	2,947	61.2%	1,680	34.9%	177	3.7%	10	0.2%	4,814
Total	16,312	69.9%	5,477	23.5%	570	2.4%	983	4.2%	23,342

Caption: Figure 4

The university also monitors dashboard usage. Whenever new computer systems are introduced, some employees continue to rely on obsolete paper processes rather than learn the new routines. By monitoring usage, the university can identify where it needs to provide better training for advisors whose work requires use of the new systems.

Supporting Students

Although the key function of eAdvisor tools is to help students take a direct path to a degree, research on student success indicates that other elements of the student experience are also critical. But at ASU, like at other complex institutions, data on students has resided on various systems. So the university created the Student-360 view and retention dashboard, which consolidates all student information

Using this dashboard, an advisor can not only see which students are off track and why but drill down to other information, determine what action is needed, and contact the student.

The Student-360 view draws on the experience of Virginia Polytechnic Institute and State University (Virginia Tech) where, at the time of the tragic events of April 16, 2007, many offices had information on students but none had the full picture of

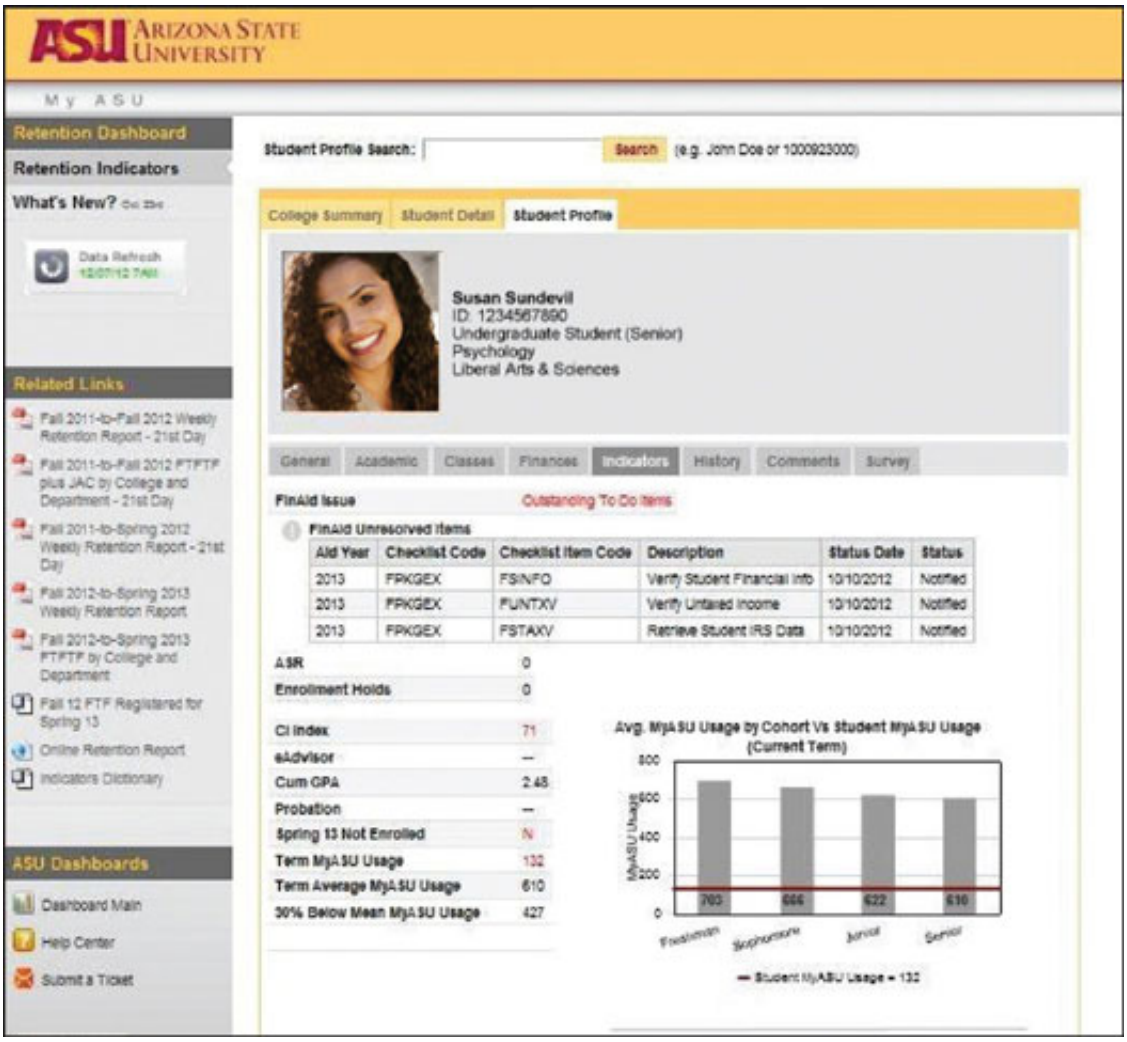
any one of them. The complete view of students' activities enables the university to offer, among other things, a much more comprehensive response to warning signs and crises, as well as other kinds of student support.

The Student-360 view at ASU consolidates information from many different databases—financial-aid and police records, residence-hall data, academic transcripts, advisors' notes, and student judicial hearings (it houses a central record for academic misconduct). Without the database, one college might dismiss a student for a cheating incident and another could subsequently admit that individual without knowing about the first incident. As is always the case with student data, access is restricted to university employees in student affairs and other student-centric offices with a need to know.

With its information from multiple university offices, the Student-360 view serves as an important tool for advising. Often students' academic challenges have a basis in non-academic issues, which it can identify.

The metrics included in this retention dashboard (Figure 5) are

- A financial-status report: This includes scholarship-renewal, financial-aid, and academic-progress information.
- The Calculated College Readiness Index: A unique ASU score is assigned upon admission, taking into consideration high school GPA/class rank, test scores, and other factors indicating that the student is ready for college.
- An academic status report: ASU's version of midterm grades is captured at two points in a semester, allowing faculty to choose a letter or a satisfactory/unsatisfactory grade and provide reasons and recommended actions for students to take.
- An off-track status report: This report, supplied by eAdvisor, indicates a dropped or missed critical tracking requirement (see above).
- “My ASU” usage: This tool tracks portal usage by students, indicating a level of engagement consistent with retention (see below).
- GPA.
- Probation status.
- Transcripts sent to other institutions (excluding medical, law schools, etc.).
- Enrollment holds.



Caption: Figure 5

My ASU, the university's main portal to courses and student activities, is a particularly interesting metric. How many times students access My ASU is a useful measure of their engagement and academic activity. Analysis of these data has revealed that poorly performing students in danger of dropping out generally have low levels of My ASU access, so an advisor might choose to intervene when that usage drops. The ability to see all these data in any combination allows advisors and other university officials to step in before students have made up their minds to leave.

The dashboard also has a space for advisor comments. This provides a continuous record of advisor-student interaction, recommendations made, and other remarks about an individual student's concerns. Consistent advice is then possible, because a new advisor will have a good record of what has gone before.

Smart Data, Not Big Data

Using databases, analytics, and data mining can improve academic advising and student success. But “big data” alone do nothing without analysis and a clear method for using particular information for a specific purpose.

The eAdvisor system addresses a problem of inadequate student knowledge about majors, which had been leading to poor choices, academic difficulties, and lower retention and graduation rates. It supports advisors, who can't possibly keep track of the requirements for all majors and the optimal paths through them, by providing them with the information they need to help students and give good advice to those who wish to pick or change majors. The data it provides also allow the university to identify the courses that predict success in each major and to supply them when they are needed.

While it is based on faculty-designed curricula and majors, eAdvisor has refocused the university on students. The

leadership for these changes and the design of the underlying concepts came from the academic administration, which now can make better decisions based on data. Meanwhile, the institution's technology leadership provided and is constantly improving the tools needed to give students better chances of success. EAdvisor is truly an all-university effort.

Resource

1. NACADA (2011) *Academic advising programs: CAS standards and guidelines*, Council for the Advancement of Standards in Higher Education., Washington, DC. Retrieved from **http://www.cas.edu/getpdf.cfm?PDF=E864D2C4-D655–8F74–2E647CDECD29B7D0**

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