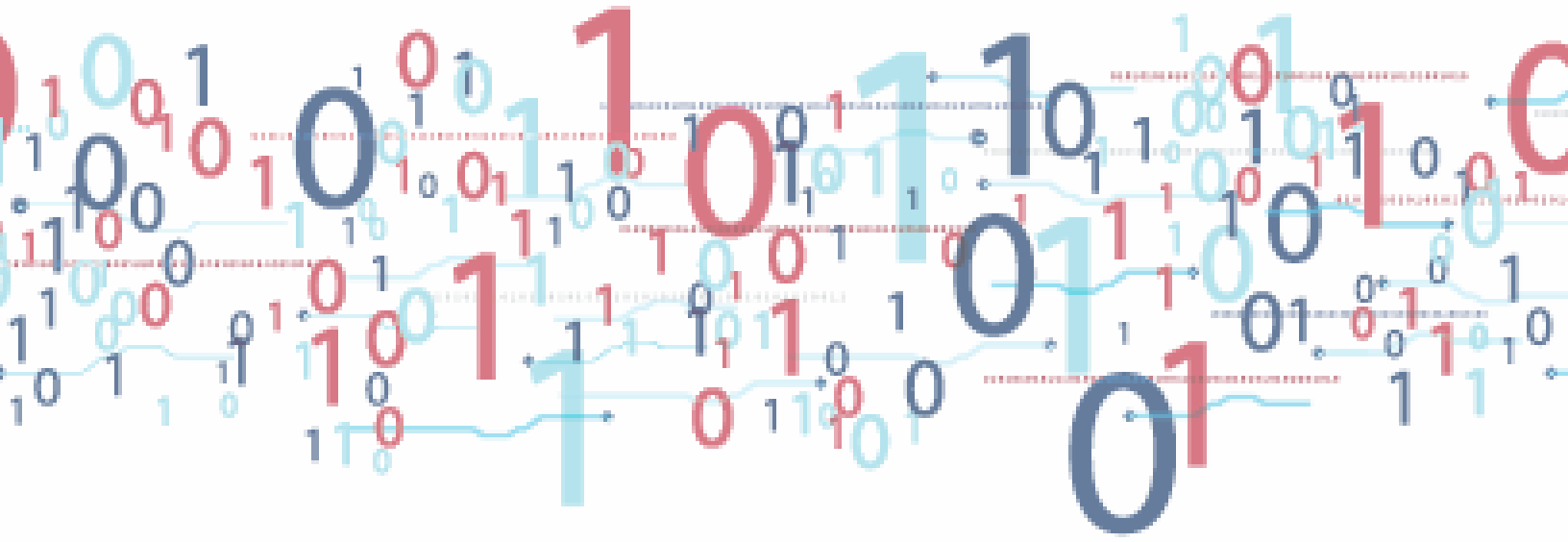
MIS DEPARTMENT
ACADEMIC PROGRAM REVIEW
SELF-STUDY



Eller MIS

Fall 2022

Sue Brown
Wei Chen
Faiz Currim
Erin Dietsche
Matt Hashim

TABLE OF CONTENTS

A. SELF-STUDY SUMMARY

The Management Information Systems (MIS) Department is one of the six departments in the Eller College of Management at the University of Arizona. Founded in 1974 by Jay Nunamaker, the department was a pioneer in defining and advancing the field of Information Systems. Since its inception, the MIS Department has made outstanding contributions to the field, both by creating relevant and impactful research and by offering leading edge educational programs. The department has well-established and highly successful research centers that have generated over $120M in funded research projects since the 1980s. MIS faculty have also been successful with tech transfer initiatives through successful commercialization of their research. The department is generally considered a top 5 department in the field of information systems.

The department offers undergraduate, master's, and PhD programs in MIS. Over 6,000 students, including over 290 PhD students, have graduated from these programs. The programs are typically ranked at the top in the MIS field. *US News & World Report* currently ranks the undergraduate program #5 (in the most recent 2023 rankings) and the MS MIS program #3 among all universities. Both the MS MIS online and the MS Cybersecurity programs are ranked #5 among all universities (#2 public). The newest program, the Master of Business Analytics (MSBA), is currently ranked #10 among public universities (#31 overall).

Since its last Academic Program Review (APR), the department has continued its trajectory of excellence with high level contributions in the dimensions of research, academic programs, and outreach, as outlined in detail in this self-study. Some of the highlights of the department's scholarship are: $38M of funded research, 286 publications in 118 journals, and #8 in research published in the 3 premier journals in the field. In terms of program highlights, the enrollments of both the undergraduate and MS programs have increased and enrollments in the online programs (new since the last review) are just over 180 students.

Because of the deep expertise of the faculty along its core competencies of business analytics, security, and advanced technology systems, the department is extremely well positioned to continue to lead in the years ahead. The information revolution has reached a critical juncture in which the concomitant effects of the advances in cloud computing, social computing, big data, cybersecurity, and mobility have created an environment that demands high levels of expertise in the areas in which the MIS department has built its core competencies. We can and should continue to play leading research roles in these areas through collaboration with industry and other units on campus in healthcare analytics, cybersecurity, and social media analytics. The academic programs, especially the MS MIS program, provide a strategic platform for the delivery of education services in the areas of high demand. This platform has been enhanced with online capabilities that are fundamental for the delivery of education in the 21st century. Surprisingly, we face a challenge with growing the applications and enrollments in the MSBA program. The remainder of the challenges we face relate to the fiscal instability that still permeates the budget of the Eller College and the University of Arizona. The department needs to receive its share of revenue distributions and requires additional staff and faculty to maintain and grow its academic programs. Although the University has improved in recent years, we need a system to guarantee raises and adequate salary compensation for the faculty. As this self-study demonstrates, the department collectively possesses an entrepreneurial spirit, a timely depth of knowledge in critical areas of high demand, a tradition in interdisciplinary collaboration, and the willingness to make a difference in the field to continue to lead and shape the future of MIS.

The MIS Department currently has 6 Full Professors, 4 Associate Professors, 4 Assistant Professors, 2 Professors of Practice, 3 Senior Lecturers, and 3 Lecturers. We also leverage 4 adjunct professors. The department rarely has post-docs.

We currently have undergraduate programs in MIS and Operations and Supply Chain Management (OSCM). We are home to four graduate programs: Master of Science in MIS (main campus), Master of Science in Business Analytics (main campus), Master of Science in MIS (online), and Master of Science in Cybersecurity (online). We also have a PhD in Business Administration with a concentration in MIS. Table A1 shows the most recent enrollments in each of those programs.

Table A1: Program Enrollments

Program	**Enrollment**
BSBA – MIS	373
BSBA – OSCM	66
MS MIS (main campus)	153
MSBA	12
MS MIS (online)	116 (includes 19 online certificates)
MS Cybersecurity	73
PhD	22

B. UNIT DESCRIPTION AND GOALS

Since its founding in 1974, the MIS Department has continuously been recognized as a major force in advancing and shaping the Information Systems discipline. Working closely with the Association for Computing Machinery (ACM), the MIS Department developed one of the first IS curricula in the country. Throughout the years, MIS has always been recognized as a top 5 department in the areas of information systems knowledge creation and education. The MIS undergraduate and graduate programs have been consistently ranked in the top 5 programs by *US News & World Report* since its rankings began in 1983. The highly respected MIS research faculty, who largely focus on producing opportunities for high impact research, have obtained external funding over $120 million since the 1980s. Our faculty have embraced technology transfer by commercializing three highly successful endeavors and played leading roles in publishing top research in the field.

1. Overview of Key Accomplishments in the last 7 years

Since its last APR review, the MIS Department has continued its trajectory of excellence, expanding its impact and reach. Some highlights of its accomplishments in the last 7 years are:

- For the last 3 years, the graduate program has been ranked #3 in the country (behind MIT and Carnegie Mellon), and #1 among public universities by *US News & World Report*.
- For the last 3 years, the undergraduate program has been ranked #4 in the country, and #2 among public universities by *US News & World Report*. The most recent (2023) ranking puts the program at #5 overall, #3 public.
- The department has expanded its online offerings following the successful launch of the *MISOnline* program in 2013 to include an online Cybersecurity program (launched in 2017). Our online programs are both currently ranked #2 among public universities and #5 overall, according to *US News & World Report*.
- The department took on the administration of the college's Master of Science in Business Analytics program, which includes classes from Economics and Marketing. It was ranked #10 public according to *US News & World Report*'s 2022 rankings.
- New MS enrollments have remained steady at around 90 (except for during COVID when international students were unable to travel). We typically have 85-95 new students each year in the full-time MS program. Applications have stabilized at around 400-450 per year.
- The department made multiple changes to the PhD program. These changes include removal of all but one master's course as part of the core requirements, development of an annual review process, creation of a research and travel fund tied to major program milestones, and the creation of multiple doctoral seminars addressing topics in design science, economics, data and web mining, and network science. In addition, we increased the requirement for quantitative courses from two to three.
- MIS faculty members led the effort to obtain Certificates of Academic Excellence (CAE) in information assurance (2014) and cybersecurity research (2017). The CAE for information assurance was renamed to cyber defense and was renewed in 2022. The CAE for research is currently up for renewal.
- MIS faculty members led the effort to create the Cybersecurity Scholarship-for-Service at the University of Arizona (Hsinchun Chen, PI, in collaboration with ECE and Computer Science), with

an initial funding of $5.3M from 2013 to 2019, and a successful renewal from 2019 to 2024 for $3.7M.

- MIS faculty have been involved in major successful grant acquisitions in the last 7 years totaling over $38M.
- Neuro-ID was launched in 2014 by Joe Valacich and former PhD student Jeff Jenkins. The launch was completed through a collaboration with Tech Launch Arizona. It has received over $50M in funding and has over 80 employees.
- The faculty has excelled at publishing top level IS research in the last 7 years. Hsinchun Chen, Jay Nunamaker, and Joe Valacich are among the top researchers in the field as measured by their h-indexes. The department has regularly been ranked among the top departments in research productivity in the top 3 journals of IS: *Information Systems Research*, *MIS Quarterly*, and *Journal of MIS* (https://www.aisresearchrankings.org/rankings/).
- Sudha Ram launched a new journal with Taylor & Francis Publishers – the *Journal of Business Analytics.*
- Since the last review, Hsinchun Chen was inducted as a Regents' Professor, Sudha Ram was named a distinguished fellow of ISS, and Sue Brown and Sudha Ram were named AIS Fellows.
- The faculty continues to be heavily involved in leading editorial roles, with several appointments at the Senior Editor and Associate Editor levels of major journals.
- Inspired by the vision of the Arizona Advantage Pillar and the Eller College's commitment to diversity and inclusion, the department has partnered with forward-thinking donors to find opportunities to address the historic underrepresentation of women and people of color in information systems professions. Each year since 2016, our Career Management team has been able to offer scholarships to a diverse cross-section of students in our professional programs so that they can join over 20,000 of their peers at the international Grace Hopper Celebration of Women in Computing conference, which is the world's largest research, education, and professional networking gathering recognizing the role women in computing.
- The MicroAge Lab was re-branded to the McKeever Family Foundation Lab and was refreshed in 2018 with a gift from the McKeever family. It is equipped with the latest technology to support teaching, experiential learning, and research using the latest technologies. The McKeever Lab supported all aspects of the department's mission during the pandemic for Eller staff, students, and faculty by offering remote and online access to state-of-the-art technology when working from home.
- With financial support of two donors, we established the Chen-Chow Bear Down Scholars (CCBDS) program in 2020 intended to raise the awareness of business disciplines and the MIS field among the Indigenous students.
- In conjunction with the CCBDS, the department launched a University of Arizona chapter of the American Indigenous Business Leaders (AIBL) organization and sent two students to the annual conference in Palm Springs in 2022, accompanied by their advisor, Dr. Bill Neumann.
- Following its long interdisciplinary tradition at the university, the department has positioned itself as a leader for partnering with other campus units in the areas of informatics and big data analytics, with focus on healthcare analytics and information security.

2. MIS Department's Vision, Mission, Strategic Plan, and Goals

Vision
The MIS Department in the Eller College of Management will be the leading knowledge and talent producer in the field of Information Systems.

Mission
The mission of the MIS Department is to create and advance new knowledge that shapes the MIS discipline and to deliver high quality educational programs that prepare students to be responsible leaders in the jobs of today and those of tomorrow.

Strategic Directions

A. Strategic Direction 1: Conduct research that has high impact and practical relevance.

Research publications is a key metric for evaluating both individual and departmental impact. Publishing in top quality outlets is important for maintaining, and improving, our reputation among peer and aspirational peer schools. Obtaining grants demonstrates the scientific and, potential for, practical relevance of the research. This is an area in which the MIS Department excels with respect to our peers, and we are committed to sustaining this standard of excellence. This also aligns well with the University's second pillar, focusing on grand challenges. Research in MIS has examined both human and intelligent systems as well as healthcare technology.

The MIS Department will continue to recruit faculty with the goal of developing a portfolio of faculty expertise. Faculty will be incentivized to contribute to the portfolio by publishing in key journals and/or pursuing extramural funding.

Goals:

a. Publish in top-tier outlets; Achieve top 5 ranking on the AIS list
The MIS faculty are extremely productive and publish in a wide variety of outlets. There are two journal lists that help with the Eller College's and the MIS Department's rankings. The UT Dallas list is often used by deans to assess the quality of a business school. The AIS list (referred to in this document) is used to compare across MIS departments. MIS is currently 8th in the AIS list for a seven-year period that includes 2015-2021. We aim to be in the top 5 in terms of productivity on this list within the next five years.

b. Increase grant-funded research in the department by 10%
The MIS Department has a history of grant-funded research. It is important to continue this tradition and encourage junior faculty to engage in the process. Although we are already at the top in terms of funding of MIS programs, business school deans are increasingly seeing the value of extramural funding. We aim to retain our top spot.

c. Foster an entrepreneurial environment that encourages product launch
The MIS Department has been successful in launching technology initiatives beginning with GroupSystems, CopLink, and now Neuro-ID. This flows from the grants process, but also from the University and department's culture of providing support for such initiatives. We aim to have another launch by our next APR.

B. Strategic Direction 2: Deliver high quality educational programs that are in demand now and in the future

The MIS Department is committed to continual improvement in the content and delivery of courses. We pride ourselves on offering content that is current and forward looking. We work with corporate partners and our alumni to assess the content of our courses and identify topics that will prepare students for jobs of the future. Successfully achieving this strategic direction means that we continue to attract and place the very best students in the very best companies.

With an eye toward the future, the MIS Department will engage in systematic curriculum review, both internally and externally. We will leverage the currency of our curriculum to increase our recruiting of students across programs. In addition, faculty will participate in teaching-related professional development activities, as appropriate, to connect the content with the delivery techniques. This direction is squarely in line with the University's first pillar, which is focused on preparing students for a rapidly changing world.

Goals:

a. **Maintain top 5 ranking in MIS and improve other rankings**
The on-campus undergraduate and graduate MIS programs are currently ranked in the top 5, according to *US News & World Report*. Maintaining those rankings is important as they are a signal of excellence to future students. The online MIS and Cybersecurity programs also enjoy a top 5 ranking (#2 public). The business analytics program is currently ranked 31st (#10 public). We aim to have all of our programs in the top 5 within the next five years.

b. **Achieve 75% placement at graduation and 100% placement at three months after graduate for on-ground programs**
Placements are essential for attracting new students. They also enhance the reputation of the program among recruiters, thus enabling greater placement. Our placement rates have ranged from 50-95% at graduation. Three months post-graduation, we are typically 90-100%. We aim to see all of our graduates seeking employment placed within three months after graduation.

c. **Leverage multiple approaches to enhance and assess teaching**
The department has relied heavily on the Teacher Course Evaluations and now the Student Course Surveys to assess teaching. For pre-tenure and pre-promotion faculty, we have also engaged in peer reviews of teaching. For the most part, teaching quality in the department is quite strong. However, there are opportunities to be even stronger. The department will launch a beta teaching assessment rubric this academic year for evaluation. The goal is to provide a more robust perspective of teaching quality while also creating an environment where risk-taking in teaching innovation is rewarded.

d. **Engage in pro-active course development and curriculum refresh**
We recognize and embrace the changing nature of the information systems landscape. As a recognized curricular leader, we have a history of developing courses (e.g., Cloud Technologies) and programs (e.g., Cybersecurity) in anticipation of their elevated importance in the market. We aim to introduce one new course or certificate (or program if appropriate) each year.

C. Strategic Direction 3: Engage in meaningful ways with external constituents

Consistent with the college's fourth strategic direction, and to advance our research and teaching missions as part of a land grant institution, it is important to develop and enhance strong external relations with our alumni, future students, donors, and corporate partners – in Phoenix and beyond. Relationships with alumni are essential for the future of our programs. Alumni can share domain knowledge through course presentations, they can help with professional development through mock interviews and workshops, and, ultimately, alumni may choose to provide financial support. In return, the alumni stay connected with the department, develop new relationships with students, and have access to potential employees. With Phoenix in our backyard, and a number of alumni and current students there, reaching out to constituents in Phoenix is very important. Developing relationships with new corporate partners helps us stay relevant in our curriculum and provide employment opportunities for our students.

The MIS Department will engage in relationship building with our current students, alumni, corporate partners, and community members to enhance the brand, grow our programs, provide meaningful practical student experiences, and increase funding for students and departmental initiatives. Engagement with the Arizona community is consistent with Pillar 3 of the University's strategic plan that is focused on driving social, cultural, and economic impact in the state.

a. Increase alumni engagement by 10% annually
Increasing the number of alumni who engage with the department is essential for our students and our faculty. Alumni provide mentoring and job opportunities for the students, while also providing guest speakers, course input, and research opportunities for the faculty. Ultimately, engaged alumni evolve from donating time and talent to donating treasure, which is valuable for the department as a whole.

b. Develop new corporate and community relationships
Our students rely on our corporate relationships to provide access to jobs and industry knowledge. Our faculty also rely on these relationships for research opportunities and class speakers. As a land grant institution, we strive to provide meaningful opportunities for community engagement. Although we have a set of organizations with which we are connected, the changing nature of our discipline requires us to be actively engaged with organizations to anticipate future needs from both a research and teaching perspective. We aim to make at least one new connection per year.

c. Increase financial donations
The department is fortunate to have a number of funded scholarships for undergraduate, master's, and doctoral students. In addition, some donations have no, or limited, restrictions. In order to foster growth in our graduate programs, additional scholarships are needed. Further, the department is currently lacking in endowed chairs, something essential to attract and retain the very best faculty. The technical nature of our courses and research requires an up-to-date technical infrastructure that needs to be refreshed regularly. Finally, the Scholarship for Industry (SFI) cybersecurity program relies on providing funding for the students. These are the priority needs for the department in the coming years, and we will work with the development team in Eller to increase donations to achieve these goals.

d. Increase engagement with the Native Nations
An important objective of the Chen-Chow Bear Down Scholars Program is to engage with the Native Nations in Arizona in order to encourage future Indigenous college students to

join the University and, more specifically, the Eller College and the MIS Department. Current students in the program are an essential element of this outreach. We aim to grow the number of students in the program as well as those participating in the American Indigenous Business Leaders (AIBL) campus organization. Within three years we aim for AIBL to be a student-led organization.

D. Strategic Direction 4: Acknowledge and reward faculty, student, and staff excellence

The MIS Department has a tradition of excellence. Many of our faculty and staff have received recognition of that excellence over the years. We are home to the only Regents' Professors in the Eller College, and we have two of them. Recognitions of excellence are important mechanisms for motivating personnel and obtaining broader acknowledgement of department success.

a. **Increase faculty recognition for their contributions through increase in nominations** Awards and recognition are valuable from both a morale perspective and a reputational perspective. The more of our faculty who are recognized for their contributions, the more positive they feel and the more recognition the department receives. We aim to increase faculty recognition by proactively nominating our colleagues for relevant awards.

b. **Increase staff recognition for their contributions through increase in nominations** Awards and recognition are valuable from a morale perspective for our staff. In many cases, simply being informed of a nomination can make the difference for a staff member. We aim to increase staff recognition by proactively nominating our staff for relevant awards.

c. **Increase student recognition for their contributions through increase in nominations** Awards and recognition are valuable for students in terms of recognizing excellence, providing resources, and documenting achievements that can help them stand out when seeking employment. The more of our students who are recognized for their achievements, the more positive they feel and the more recognition the department receives, particularly from recruiters. We aim to increase student recognition by proactively nominating them for relevant awards.

3. Research Centers and Labs

The department is home to three centers and two research labs.

- **AI Lab.** Founded and led by UA Regents' Professor Hsinchun Chen, the Eller Artificial Intelligence Laboratory is the world's only AI lab or center within a business school. In this unique setting, and under visionary stewardship, the lab has become a distinguished academic force making significant contributions to our understanding of health informatics, security informatics, business intelligence and knowledge management. Through sophisticated information systems research, the AI Lab has made significant contributions in machine learning, visualization, knowledge management and other critical areas. Research findings from the AI Lab have been featured in *Science*, *The New York Times*, *Los Angeles Times*, *Business 2.0*, *The Police Chief*, *The Washington Post*, *Time Magazine Global Business Supplement*, *Newsweek*, *ABC News* and *The Boston Globe*, among others.

- **INSITE: Center for Business Intelligence and Analytics** is a big data analytics research center within the Department of Management Information Systems and Eller College of Management at the University of Arizona. The Center was created to address the ever-growing volume, velocity,

and variety of big data being generated by numerous sources including sensors, mobile applications, social media, and web-based platforms. It focuses on predictive analytics through the use of data generated from social media, internal transactional, sensor and other emerging big data to provide analytics across multiple big data platforms. It provides visualization and real time analysis of interaction patterns gleaned from big data. INSITE is a leader is developing scalable techniques for analyzing big data arising from a variety of sources including social media, sensors, mobile applications, and web-based platforms. INSITE's expertise is specifically in scalable network analysis, visualization, large-scale graph mining, and predictive modeling.

- **CMI.** A world leader in research and development of collaboration processes and technologies, the Center for the Management of Information redefines the way people work and communicate. The center has been awarded more than $100 million in grants for its cutting-edge research in collaboration, information technologies, group processes, and group support. It is the lead research institution of the Center of Excellence for Border Security and Immigration, and the faculty and student work at CMI has been featured in top journals and publications ranging from the *Journal of Management Information Systems* to *Frontiers in Information Technology and Applications*.

- **IASEC.** The Information Assurance and Security Education Center promotes cybersecurity through education, training, and research. Designated as a National Center of Academic Excellence in Cyber Defense by the National Security Agency and the Department of Homeland Security, IASEC offers faculty, students, and the community resources to study and address the cyber vulnerabilities of our nation's information infrastructure. The IASEC team works collaboratively to promote responsible information and cybersecurity practice through curriculum development, industry partnerships, cutting-edge research, and outreach.

- **NLP Lab.** Led by Gondy Leroy, the Deep Target NLP Research Group's research has focused on health literacy, autism spectrum disorders, and more. In 2021, Leroy was awarded a $1.5 million grant from the National Institute of Mental Health to support ASD risk assessment for early diagnosis. The same year, Leroy was the recipient of a $1.4 million National Library of Medicine/National Institutes of Mental Health grant to study how to use and optimize audio for health information.

C. UNIT HISTORY

1. Major Changes

Several changes have taken place in the department leadership, faculty composition, and programs since the last program review, which was prepared under former department head Dr. Paulo Goes.

Leadership
Dr. Goes resigned to become the Dean of the Eller College of Management in March of 2016. Dr. Sue Brown was named the interim department head from Spring 2016 to Spring 2017. After an external search, Dr. Sue Brown was selected as the new department head. Dr. Brown joined the University of Arizona as an Associate Professor in 2005. She previously worked at Indiana University. She began her tenure as department head in Spring of 2017.

Dr. Bill Neumann continues to serve as the director of the undergraduate and Master of MIS programs and has also taken on the Master of Business Analytics program. Dr. Yong Ge is currently serving as the director of the PhD program. The PhD program leadership rotates every few years among the tenured faculty. Dr. Ge took over from Dr. Joe Valacich in 2021.

New members have been recruited to the MIS Advisory Board. They represent large national and local employers who actively recruit our students, thus cementing industry relationships, and increasing monetary and time contributions from Board members. Examples include American Express, Dell, EY, Google, Pinterest, and Raytheon, to name a few. A new Cybersecurity Advisory Board was established in 2022 and includes individuals with cybersecurity-focused roles. More information on both boards is presented in Section J.

Faculty Composition
The composition of the faculty [*see the faculty list in Table C1*] has changed considerably since the review in 2013. The proportion of the various ranks of the tenure-track faculty is approximately the same, but there have been some changes in all ranks. Currently, there are 6 Full Professors, 4 Associate Professors, and 4 Assistant Professors. Of the full-time career track faculty, the department now has 2 Professors of Practice, 3 Senior Lecturers, and 3 Lecturers.

The department successfully recruited 8 new tenure-track and 3 career track faculty members since the last review. Unfortunately, two of the tenure-track faculty were unsuccessful in achieving tenure, four of the tenure track faculty moved to other universities, and three retired. One of the unsuccessful tenure cases was largely due to the individual having difficulty shifting from a non-business school discipline to the business school, where conference proceedings do not count for tenure and there is a need to publish in business journals. This is something that we are keeping in mind as we recruit new faculty. We currently have two open tenure-track postings – one for a senior faculty member and one for a junior faculty member.

Table C1: Faculty Composition

Rank	2012	2022
Professors		**Sue Brown**
	Hsinchun Chen	**Hsinchun Chen**
	Moshe Dror	Retired, Emeritus, deceased 2022
	Paulo Goes	Retired, Emeritus in 2021
		Gondy Leroy (Joined in 2013, Promoted in 2017)
	Jay Nunamaker	**Jay Nunamaker**
	David Pingry	Retired in 2013
	Sudha Ram	**Sudha Ram**
	Joseph Valacich	**Joseph Valacich**
	Daniel Zeng	Resigned from the University in 2019
Associate Professors	Sue Brown	Promoted in 2013
		Yong Ge (Joined in 2016, Promoted in 2021)
		Matt Hashim, Promoted in 2020
	Patti Ota	**Patti Ota**
	Suzie Weisband	**Suzie Weisband**
Assistant Professors	Jesse Bockstedt	Promoted in 2015, resigned in 2016
		Laura Brandimarte (Joined in 2015)
		Wei Chen (Joined in 2015)
	Matt Hashim	Promoted in 2020
	Mingfeng Lin	Promoted in 2017, resigned in 2018
		Taqi Raza (Joined in 2019)
		Lusi Yang (Hired in 2018; resigned in 2022)
		Seokjun Youn (Joined in 2019)
		Junming Yin (Hired in 2014; denied tenure, left in 2022)
		Bin Zhang (Hired in 2014; denied tenure, left in 2021)
	Zhu Zhang	Denied tenure, left in 2014
Professors of Practice		**William Neumann**
		Faiz Currim
Senior Lecturers	Faiz Currim	Promoted in 2021
		Eyran Gisches
	Bill Neumann	Promoted in 2013
		Mark Patton
		David Weber, Joined in 2021

Lecturers	Mark Patton Eyran Gisches Brandon Marshall Rob Owen	Promoted in 2018 Promoted in 2018 **Brandon Marshall** Retired in 2018, Adjunct 2018-2021 **Ken Gyure**, Joined in 2021 **Paul Kealey**, Joined in 2019

Program Changes and Initiatives

Driven by changes in the IT industry environment and following its strategic goals, the department continues to improve and leverage its programs at all levels, including its undergraduate majors in Management Information Systems and Operations and Supply Chain Management (recently re-branded), Master of Science in MIS, Graduate Certificate Programs, and PhD in Management Information Systems. Since the last review, the department has added an online Master of Science in MIS program and an online Master of Science in Cybersecurity (jointly offered with the College of Engineering). In addition, the department is home to the Eller College's Master of Science in Business Analytics.

Undergraduate Program

Major program changes and initiatives that have occurred include:

- Established the Chen-Chow Bear Down Scholars program aimed at increasing participation among the Native American student community in business generally, and MIS specifically. The program is supported through a generous donation from Drs. Hsinchun Chen and Sherry Chow. The program is designed to provide students with exposure to Business and MIS topics and provide opportunities for professional development. As part of the program, the department launched a University of Arizona branch of the American Indigenous Business Leaders (AIBL) organization, and in its first year, sponsored two students to participate in the national AIBL conference.
- Re-branding and re-positioning of the Operations Management major. In 2019, the department renamed the Operations Management major to Operations and Supply Chain Management. This was done to highlight the emerging significance of supply chain management as part of the major in recognition of the changing national landscape with regard to operations and supply chain. The required courses in the major will soon include supply chain management and further changes are anticipated in the next two years. During the re-branding, we also changed the prefixes of the courses from MIS to OSCM to further highlight the differences in content in the courses.

Graduate Programs

The department recognized the strategic importance of its top-ranked MS MIS program in many ways: (a) It is a major component of its portfolio of products, where fluctuations of domestic demand for undergraduate IT education can be balanced with the MS MIS program, by catering to international graduate audiences and domestic working professionals; (b) Its curriculum is closely aligned with the core competencies of faculty research. The faculty takes pride in developing and advancing the MS MIS curriculum and teaching its courses; (c) It serves as a strategic curricular platform to launch related and adjacent programs, such as the online MS MIS program, online Cybersecurity program, and MBA concentrations. These programs extend the department's reach along its core competencies and can provide important sources of revenue.

Major MS program initiatives that have occurred are:

- Launched full-fledged online MS MIS program in March 2013, along with online certificates in Enterprise Security and Business Intelligence and Analytics.
- Launched online Master's in Cybersecurity Program in conjunction with the College of Engineering in 2017.
- Created the Scholarship for Industry program for cybersecurity. It was officially launched in 2017 and mirrors the NSF-funded Scholarship for Service program that was originally funded and launched in 2014. Both programs are aimed at training graduate students in cybersecurity as part of the MS MIS ground program.
- Launched the Technology Leadership Program (TLP) in conjunction with MBA in 2018. This program is an adaptation of the dual degree program for MIS and MBA. The difference is that students are admitted directly to both programs. This allows them to take MIS and MBA courses from the start, thus preparing them for technical internships after their first year.
- Worked with Eller Business Consulting to integrate MS MIS and (later) MSBA students into the consulting projects. Prior to this, MBA and MIS each offered their own projects class to their own students. This integration is more reflective of the sorts of teams the students will be working with once they leave the program. To our knowledge, these integrated projects are unique in graduate education.
- Took over administration of the MS in Business Analytics in 2017, including curriculum oversight, admissions, advising, and placement.

These outreach, program, certificate, and online initiatives have enabled the department to see strong growth in undergraduate and MS majors in recent years and they should allow the department to continue to thrive in the near future.

2. Response to Recommendations

The prior External Review made recommendations organized by Continue, Stop, and Start. Below are each of those recommendations and the Department's response.

Continue:

1. Maintain the research, teaching, and service contributions
   The MIS department is a highly effective and entrepreneurial department with faculty and staff contributing in all dimensions under severe financial constraints. This reflects a positive culture and belief in the mission of the department as well as collegiality and mutual respect for all individuals. It is an admirable quality that is likely to contribute toward long-term success of the department.

   We have endeavored to continue this positive culture with an eye toward entrepreneurial activities.

2. Department Leadership
   By any metric, the accolades provided by all quarters to current department leadership are exceptional. The belief in the department's vision and the trust instilled by the department's leadership has made the department a desirable place to be and faculty, staff, and external stakeholders are all highly appreciative of the efforts of the current department chair.

The department has continued its strong record of academic leadership.

3. MS Program Growth
   The success of the MS program and the growth opportunities that exist are remarkable. The department is doing an exceptional job of serving the MS students. The MS program categorization as a STEM area is an example of the care that the department has taken for the well-being of its students. The program seems very "high touch" as reflected by students' mutual admiration of the faculty (students categorized the quality of instruction as "outstanding"). The department has been innovative and dynamic with the curriculum by bringing in innovation and relevance to the curriculum, for example by introducing big data track in the master's program and starting the online master's program. The committee applauds the department for its work with the program and, even with the recommendation to increase diversity in student body, the program should provide growth and revenue opportunity for the department and the school.

   The department has continued this "high touch" approach with the graduate students. Although we have intentionally not grown the ground program beyond two sections, we have been able to launch the MISOnline and MS Cybersecurity programs. We aim to provide a high level of service across all programs and platforms.

4. Online MS Program
   The department's latest initiative of an online MS program will serve the working professionals and increase the reach of the program by leveraging its international reputation. The first mover advantage should serve the department well for the foreseeable future.

   This is definitely true, as we have a fairly steady state of approximately 100 students concurrently enrolled in the program. It also enabled us to launch the MS Cybersecurity program at very little incremental cost, as we already had many courses offered online. We continue to consider new online opportunities, such as certificates, that can serve the needs of working professionals.

5. Recruiting PhD Students from General Funds
   This practice started recently is a positive development and likely to help grow the department's reputation and align it better with mainstream MIS academia. It will also help the current crop of junior faculty in succeeding by having access to doctoral students.

   This practice does continue in the department, but not consistently. The ability to recruit PhD students from general funds is largely dependent on the number of students whose grant funding has expired. Recent agreements with the college regarding the funding for PhD students should allow us to recruit one to two students per year on college funds.

Stop:

1. MS courses in the first year of PhD program
   As described in the doctoral program overview, this practice should be discontinued by actively advising students to only take these courses when necessary. The current approach creates uneasiness even among the students who are well versed in the material. Further, it would be advisable to look at the PhD training at other top MIS programs and perhaps create alternative paths for students in different tracks (technical, managerial, organizational, or economics).

   This practice has largely stopped. The PhD curriculum has been revised to provide doctoral-level seminars in lieu of the master's courses. The one master's course that remains as required for the

students (MIS 531) has a separate readings section for the PhD students that helps to orient them in research in the area of databases. The remaining master's courses have been removed from the first-year core curriculum.

2. Current compensation approach for faculty
   This is essential for retention. The pressure will only increase as the demand for MIS faculty increases and the faculty at Arizona fall further behind the market. Lack of transparency in raises also creates problems and it would be advisable to create a more transparent process.

   Current 9-month compensation levels for faculty across the tenure-track ranks now compare well to AACSB benchmarks. We do continue to lag behind our peers that are top-10 programs, but we have made great progress in terms of the base compensation. For the last two years, with an anticipation of a third consecutive year, the University has authorized raises for the faculty. After the COVID-related pay cut, this was sorely needed. It should be noted that prior to the past couple of years, the University did not have a track record of offering raises on an annual basis. Central administration appears committed to having annual raises and has conducted pay equity studies, both of which help with morale and retention.

   The second aspect of compensation is associated with summer salaries. The college guarantees 2/9ths for the first three summers. After that, assistant and associate professors can apply for funds from the college to support summer research. These funds have increased over the years, from $15,000 to $25,000, with the most recent payout being $30,000. The department has used departmental funds to cover the difference between this amount and 2/9ths for the assistant professors. For the research active Associate professors, we covered $10,000 this past summer and $15,000 prior to that. Both research active Associate professors now have fellowships of $10,000, which will be used instead of departmental funds. With the College's revenues declining, coupled with lack of revenue sharing from the College to the department in recent years, there is uncertainty regarding how long this practice can continue. The challenge we face is truly for the research active Full Professors who do not have the opportunity to receive funds from the college, nor do they receive funds from the department, except in unusual circumstances. To be truly competitive with our peers, it is essential that the college offer some summer support for ***all*** *research active faculty.*

3. Recruiting MS students primarily from India
   Student diversity will provide better experience for the students. While the program is excellent, increasing diversity will only add value to the student experience. Some of the interim steps may be to use the AMP program, recruitment from military bases and increased interaction with MBA students on a project-based class to increase the diversity of interaction for the international students.

   We strongly agree with this, however the market dictates who applies. The majority of our applicants are from India. This was certainly an issue for us during COVID, when students could not travel from anywhere to join our programs. To address this, we have (1) increased the marketing of the Accelerated Master's Program (AMP) to Eller undergraduate students, most of whom are from the US, (2) launched the SFS program and its partner SFI program, which both require students to qualify for security clearances in the US, providing a largely domestic pool of applicants and students, and (3) combined our projects class with that of the MBA program in order to provide some diversity of interaction for the students. We continue to explore opportunities for attracting additional domestic students, including actively seeking donor funding for scholarships. In addition, our online programs provide a portfolio balancing mechanism by

focusing almost exclusively on individuals in the US. This was certainly valuable during the global pandemic.

Start:

1. Increased mentoring of junior faculty
   The department should consider providing increased mentoring opportunities for the junior faculty. While a formal mentoring program may not be necessary, more interaction between senior and junior faculty can result in innovative collaborations and projects. While senior faculty seem quite open to discussions with junior faculty, at present, there is no initiative taken to facilitate this interaction.

   Junior (and mid-career) faculty mentoring has been established in the department. This is accomplished in two ways. First, each full professor is assigned to mentor one or two assistant and associate professors each year. Through this formal assignment, the pairs are encouraged to go out for coffee, lunch, or dinner funded by the department once each semester. This provides an entre for the junior faculty to connect with the more senior faculty in a way that feels a bit less formal. Research active associate professors are offered the opportunity to continue their mentoring and both have. Each assistant professor has the opportunity to be mentored by each full professor prior to tenure. In 2021, this mentoring program was extended to the career track faculty.

   In addition to the pairing approach, the department head meets with each junior faculty member twice per year. Again, research-active associates have the choice of how they would like to proceed. In the fall meeting, the department head reviews the prior year's activity and works with the junior faculty member to establish goals for the year. In the spring meeting, the department head shares the junior faculty member's annual review and discusses plans for the upcoming year in terms of research, teaching, and service. Recently hired career track faculty also meet with the department head once per year, more if they request it.

2. Increase presence in MBA program
   The department has a minimal footprint in the MBA program. Given the diversity of faculty that exist in the department, it would be advisable to create some MBA electives (perhaps in partnership with other departments) to expose the MBA students to one of the strengths of Eller.

   The department's courses are open to MBA students, however many students lack the technical background to take them. Since the last review, we have created a data visualization course and a health analytics course that are designed to be more broadly accessible. With the build-out of the Online MBA program, MIS has been able to offer all of our online courses as electives. Both of the department's certificates (Enterprise Security and Business Intelligence and Analytics) are available for any online students to pursue. We also provide concentrations designed specifically for a less technical audience (e.g., privacy and security). We recently built a health analytics class for the Master's in Healthcare Management program. We intend to open the class to all Eller master's students in spring 2023. Finally, we are working with the Marketing Department to create a product management concentration/certificate for our online and main campus students that we believe will be popular among Marketing, MBA, and MIS students.

3. Look for endowment of a center
   Senior faculty in the department head various centers. Most centers are funded from research grants. With the recent economic downturn and cuts in education spending at the federal and state levels, it may be difficult to sustain these centers solely based on research grant funding. Thus, it may be

advisable to seek funding from industry to complement research funding to sustain and operate centers.

We have been looking for this, however, to date we have not found a donor – personal or corporate – to fund such an initiative. We have two different areas of focus: analytics and cybersecurity. Both areas are heavily grant-funded. We also received provost's investment funds ($1.2M) to support the launch of our SFI program and a renovation and technology upgrade for our cybersecurity infrastructure. We are in talks with individuals and companies but have yet to close a deal to support a center for either focus area.

4. Increase student-alumni connections
   The department will benefit from better tracking of its alumni and creating student-alumni connections for a richer experience. At present such connections are made based on individual staff initiatives. A more systematic approach across all programs would leverage the department's extensive footprint.

   We have significantly improved in this area. Specifically, alumni relations has been assigned to a particular staff person (Director of Career Services), as it integrates well with the position. Alumni are being engaged on a regular basis to provide expert panels for incoming and continuing students, and they participate in mock-interviews with our students. Recently graduated students have an affinity with the career services team due to the role the team plays in assisting with the job search process and alumni happily engage with the team after graduation.

   The department has at least two alumni events planned (and budgeted) each year and we work with the College's alumni and development team to coordinate these events. In addition, the MIS Board of Advisors is passionate about furthering alumni relations. To address this, a sub-committee focused on alumni relations has been established. In the coming year, this group has two events planned. For each alumni event, we invite a group of current students to participate.

D. OVERVIEW OF THE UNIT'S ACADEMIC QUALITY

1. Academic Quality Indicators (Resources, Reputation, and Outcomes)

As with all academic departments, the University of Arizona MIS department utilizes the base **resources** of its state budget to acquire faculty and staff to create **intermediate outcomes** (gifts, grants, contracts, and program revenue) and **final outcomes** (research, student graduates, and service). The MIS Department has had an almost 50-year history (1974-present) of delivering high quality final outcomes resulting in an outstanding reputation. Over the years the department has been recognized as:

- One of the top producers of academic research (currently ranked 8th on the IS Rankings website[1] for the term of this review; multiple faculty members with H-Index over 40)
- The leader among MIS Departments in research funding (over $38M since 2015)
- The largest producer of doctoral students in MIS (over 290 since 1974)
- A top 5 MS program ranking by *US News & World Report* for 33 of the 34 years that MIS programs have been ranked (top 5 public in all 34 years and currently number 1 among public universities)
- A top 5 undergraduate program ranking by *US News & World Report* (currently number 3 among public universities); in the top 5 since the ranking began in 1989.

Although the competition in all of these dimensions is fierce and the support from the State of Arizona has dwindled, the MIS Department at the University of Arizona has been able to protect its position as a full-service department of superb quality in all dimensions.

References to the detailed discussion of the resource, outcome, and reputation issues are found in Table D1. We highlight some key quality indicators below.

Table D1: References in Report to Discussions of Resources, Outcomes, and Reputation

Resources	Reference
Faculty	See section E.
Staff	See section F.
Students	See sections H and I.
Intermediate Outcome	
Gifts	See section G.
Grants and Contracts	See section E.
Revenue Sources	See section G.
Final Outcome	
Research	See section E.
Undergraduate Program	See section H.
MS Program	See section I.
PhD Program	See section I.
Service	See Section E.
Reputation	
Faculty	See section E.
Specific Programs	See sections H and I.
Benchmarks	See below.

[1] https://www.aisresearchrankings.org/rankings/; 2015-2021; *Information Systems Research*, *Journal of MIS*, and *MIS Quarterly*

Of the six full professors in the department, four are editors-in-chief of different journals, one received a LEO award for Lifetime Extraordinary Achievement in Information Systems, four have been named AIS Fellows, one is a Distinguished Fellow of ISS, one is an IEEE Fellow, and one is an ACM Fellow. The research active faculty members also account for 33 editorial board seats on a wide variety of journals. Our faculty have, over the current review period, received many awards for research contribution, ranging from those based on a specific work at a point in time (e.g., best paper) to those based on overall achievement and impact on the field (e.g., AIS Fellow Award, ISS Distinguished Fellow). The honors are not concentrated in the hands of one or a few star faculty but are spread across the research active faculty.

The demand for our master's program has maintained over the last seven years, with applicants averaging around 450. In the prior review period, we received in excess of 1000 applicants, however we subsequently instituted a GPA calculator to assist the international applicants in converting their GPAs (typically not on a 4.0 scale) to University of Arizona GPAs based on a 4.0 scale. As a result, many of the would-be applicants discovered that they did not meet our minimum GPA cutoff of 3.0 and thus did not apply. This has left us with a set of very high-quality applicants, and we have been able to increase the program selectivity and improve the overall quality of the students admitted. The average incoming graduate student in 2022 has an undergraduate GPA of 3.44, a GMAT of 664 (or a GRE of 314), and more than two years' professional work experience related to information systems. Our placements have improved since the last review – both in terms of percentage and location. The entire December 2021 graduating class (domestic and international students) was placed by March 2022. At graduation, 95% were placed and 100% by March. The average starting salary was $107K. The Spring 2022 graduating class is following a similar pattern, with 95% having been placed at graduation with a starting salary of just over $86K. Starting salaries tend to be lower for the spring cohort as the majority of the students are AMP students, and they do not have years of prior work experience. Moreover, we have found increasing interest in our students from companies such as Ernst & Young (EY), Amazon, American Express, Microsoft, and Salesforce.55

2. Top Programs in Management Information Systems

The University of Arizona MIS department is indisputably one of the top 5 departments in the field inclusive of the private universities, MIT and Carnegie Mellon University, based on the *US News & World Report* rankings[2] (see Table D2).

Table D2: *US News & World Report* Ranking of Undergraduate and Graduate MIS Programs

School	US News & World Report Graduate Ranking	US News & World Report Undergraduate Ranking
Massachusetts Institute of Technology	1	2
Carnegie Mellon	2	1
University of Arizona	**3**	**5**
Georgia Institute of Technology	4	3
New York University	5	--
University of Texas at Austin	6	4
University of Minnesota	7	6
University of Maryland	8	8
Indian University – Bloomington	9	7
University of Pennsylvania	9	--
Arizona State University	--	10
Georgia State University	--	9

[2] https://www.usnews.com/best-graduate-schools/top-business-schools/information-systems-rankings and https://www.usnews.com/best-colleges/rankings/business-management-information-systems

As indicated at the beginning of this section, the University of Arizona MIS department is a top program in all dimensions of output: top producer of published research, top receiver of grants and contracts, and a top producer of students at all levels. There could be some argument about the top public programs other than the University of Arizona; however, we have selected the following programs based on their *US News & World Report* rankings of being in the top 10 for both undergraduate and graduate education:

Georgia Institute of Technology
Indiana University, Bloomington
University of Maryland
University of Minnesota
University of Texas at Austin

As can be seen in Table D3, the department compares favorably with these top programs in MIS, even though we are smaller than all but one. While our research ranking for the time period of this review is 8, that ranking focuses on three of the journals that represent the broad area of MIS research. Given the diversity of research in our department, as well as the grant activity, that ranking represents only a subset of our overall productivity.

Table D3: Comparison of University of Arizona Faculty Research to Peers

	Faculty Size (2022)			**Research Ranking[1]**
	Full	**Assoc**	**Assist**	
Arizona	6	4	4	8
Georgia Institute of Technology	5	3	0	22
Indiana University	8	10	15	9
University of Maryland	12	6	5	9
University of Minnesota	6	4	6	5
University of Texas at Austin	19	5	11	9

Notes:
[1] https://www.aisresearchrankings.org/rankings/; 2015-2021; *Information Systems Research*, *Journal of MIS*, and *MIS Quarterly*

We were able to use Academic Analytics to do comparisons with other AAU public institutions (but only two of the five institutions listed above were included in the data set). Thirty-six institutions are included in the analysis. Figure D1 shows the articles and faculty market share for the top nine institutions; the University of Arizona MIS Department ranks 4th on this list. The bar shows the total number of publications and the figure represents the relative share of the faculty size in the comparison group. Figure D2 shows a similar graph for the top nine institutions in terms of grant funding. The University of Arizona MIS Department ranks number one on this list. Finally, Figure D3 shows a similar graph for awards, and we rank 2nd on this list. The cumulative evidence demonstrates the quality of the faculty research in the MIS Department.

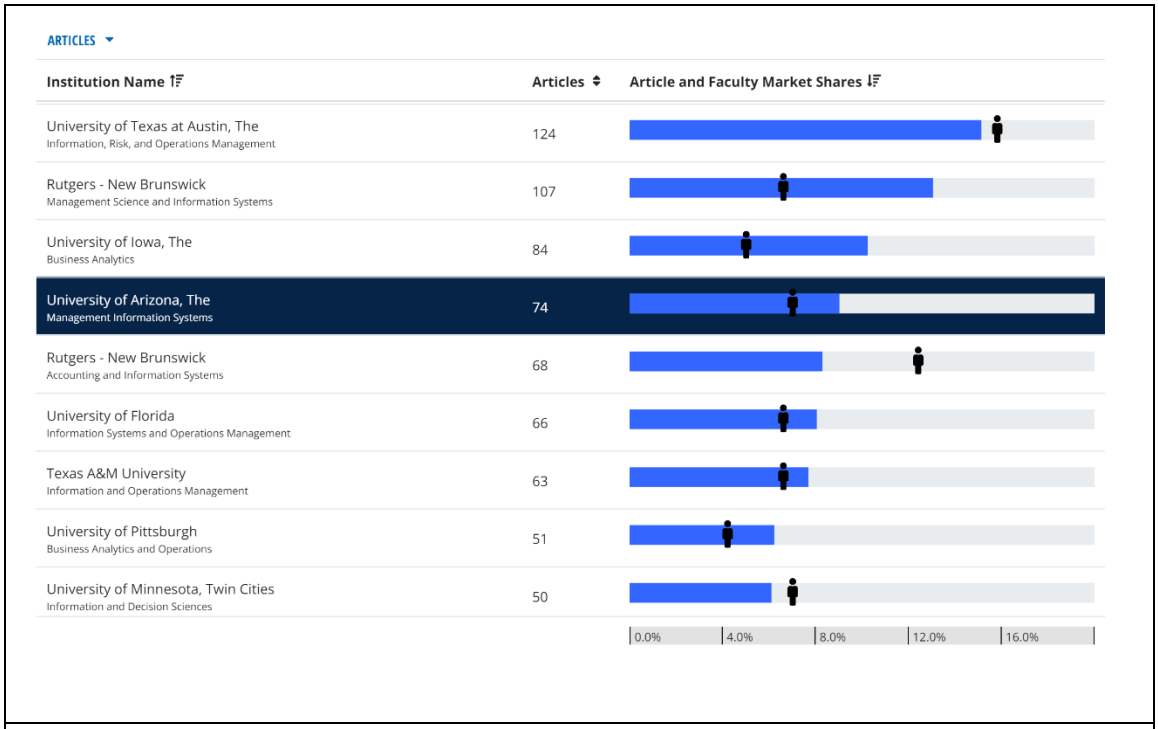


Figure D1: Articles and Faculty Market Share

Figure D2: Grants and Faculty Market Share

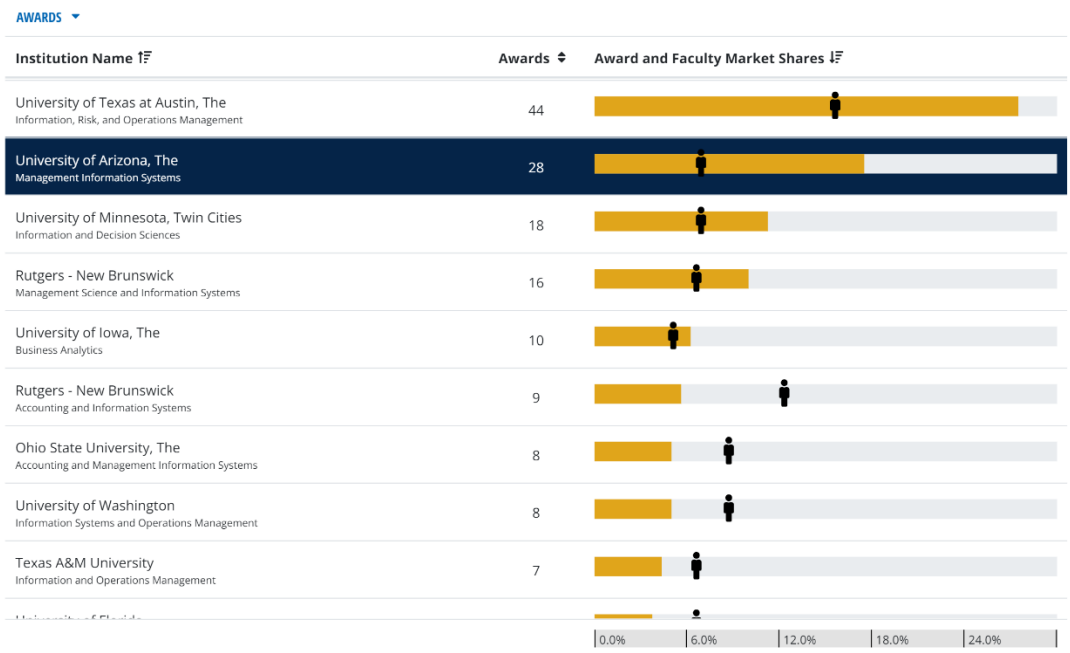


Table D3: Faculty Awards and Market Share

E. FACULTY

Contributions by the faculty support the three main goals of the department: research, teaching, and service. Below we report several metrics in each of these areas, but the bottom line is that talented faculty members create a highly synergistic, innovative environment that raises the level of excellence in research, teaching, and service. The fundamental research provides opportunities and funding for student education at all levels and creates unique service possibilities. These opportunities unfold in the participation of undergraduate, master's, and doctoral students in basic research, in the dispersion of the latest knowledge in the classroom and to IT professionals and organizations, in the creation of patents and technology transfer partnerships for the University, and in the participation of the faculty in leadership roles in the wider profession.

1. Faculty Research

Management Information Systems by its nature is interdisciplinary. The field draws upon several reference disciplines. One of the University of Arizona MIS faculty's greatest strengths is its intellectual diversity. The faculty has terminal degrees in the social sciences, business, computer science, and engineering. The variety of intellectual backgrounds supports involvement in a wide range of interdisciplinary collaborations, the use of different research methodologies and approaches, and varied teaching styles. This diversity is reflected in the variety of funding sources and the publication outlets, conference activities, and professional service in which the faculty members have disseminated their work.

Publications

Research publications demonstrate the impact the faculty members are making on the field. Table E1 provides a summary of the articles published by the University of Arizona MIS faculty since the last APR. Consider a few observations on this data:

- From 2015 to 2022 MIS faculty members have published 286 articles in 118 journals.
- MIS faculty members publish heavily in the top journals of MIS (80 of the 286 papers), as those journals cut across technical and managerial aspects of information technologies.
- From 2015 to 2021 the department ranks 8th globally for publications in the premier mainstream MIS journals (*MIS Quarterly*, *Information Systems Research*, and *Journal of Management Information Systems* - https://www.aisresearchrankings.org/rankings/), while producing over 200 additional articles in related areas.
- Some faculty in the areas of design/development of cutting-edge technologies (such as deep learning, text/data mining, deception detection/collaboration, and data modeling/web services) publish in established technical journals, such as IEEE (Institute of Electrical and Electronic Engineers) journals, ACM (Association of Computing Machinery) journals, and computer science journals.
- Some faculty members not only publish in the top MIS journals but also publish in the established journals in fields such as psychology, management, economics, and healthcare (such as *Science*, *Management Science, Manufacturing & Service Operations Management, Production and Operations Management, Journal of Consumer Psychology, Journal of the American Medical Informatics Association,* and *Journal of Medical Internet Research*). The department views the fact that faculty in an interdisciplinary department also publish in the reference disciplines as a strong signal regarding the strength of the research.

Table E1: Publications of MIS faculty from 2015 to 2022.

Top Mainstream MIS	***#***
Decision Support Systems	9
Information Systems Research	13
Journal of Management Information Systems	23
Management Science	7
MIS Quarterly	28
Other Mainstream MIS	
AIS Transactions on Human-Computer Interaction	3
AIS Transactions on Replication Research	3
Communications of the AIS	3
Computers in Human Behavior	2
European Journal of Information Systems	1
Information Sciences	1
Information Systems Frontiers	3
Information Systems Journal	1
INFORMS Journal on Computing	2
Journal of the Association for Information Science and Technology	5
Journal of the Association for Information Systems	5
Journal of Business Analytics	1
Applied Information Systems	
Behavior & Information Technology	1
Bioinformatics	1
Business & Information Systems Engineering	1
Elsevier Journal Computers, Environment and Urban Systems	1
Expert Systems with Applications	1
Knowledge and Information Systems	2
Knowledge-Based Systems	3
International Journal of Business Information Systems	1
International Journal of Conceptual Modeling	1
Journal of Behavioral and Experimental Economics	1
Journal of Behavioral Decision Making	1
Journal of Biomedical Informatics	3
Journal of Data and Information Quality	1
Journal of Database Management	2
Journal of Electronic Commerce Research	1
Journal of Information Systems Education	1
Journal of Nanoparticle Research	2
Online Information Review	1
Physica A: Statistical Mechanics and Its Appliations	2
Scientometrics	2
Sports Technology	1
Technological Forecasting and Social Change	1
Technology in Society	1
Wireless Personal Communications	1
Other Top Business and Science	
Journal of Operations Management	1
Manufacturing & Service Operations Management	1
Nature Scientific Reports	1
Production and Operations Management	6
Science	2
The Accounting Review	1
Business, Psychology, and Economics	
Communications Monographs	1
Diritto Pubblico	1
Entrepreneurship Theory and Practice	1
Finance Research Letters	1
Games - Special Issue Logistics Games	1
Journal of Business Research	1
Journal of Consumer Psychology	2
Journal of Economic Behavior and Organization	1
Journal of Experimental Psychology: General	1
Journal of Experimental Social Psychology	1
Public Administration Review	1

Quality and Quantity	1
Rivista di Politica Economica	1
Simulation & Gaming	1
SpringerPlus	1
Theory and Decision	1
Computer Science	
Computers & Security	1
Concurrency and Computation: Practice and Experience	1
Cluster Computing	1
Data and Knowledge Engineering	1
Frontiers of Computer Science	2
Future Generation Computer Systems	1
Journal of Machine Learning Research	1
ACM	
ACM Computing Surveys	1
ACM Transactions on Information Systems	3
ACM Transactions on Intelligent Systems and Technology	4
ACM Transactions on Knowledge Discovery from Data	2
ACM Transactions on Management Information Systems	10
ACM Transactions on Privacy and Security	1
ACM Transactions on the Web	2
IEEE	
IEEE Access	1
IEEE Computer	1
IEEE Intelligent Systems	3
IEEE Intelligent Systems Special Issue on Predictive Analytics	1
IEEE IT Professional	1
IEEE Journal of Biomedical and Health Informatics	5
IEEE Journal on Selected Areas in Communications	2
IEEE Systems Journal	1
IEEE Transactions on Affective Computing	1
IEEE Transactions on Cloud Computing	1
IEEE Transactions on Computational Intelligence & AI in Games	1
IEEE Transactions on Computational Social Systems	1
IEEE Transactions on Cybernetics	1
IEEE Transactions on Information Forensics and Security	1
IEEE Transactions on Knowledge and Data Engineering	22
IEEE Transactions on Network and Service Management	2
IEEE Transactions on Professional Communication	1
IEEE Transactions on Systems, Man and Cybernetics	2
Healthcare	
Addiction	1
American Journal of Respiratory and Critical Care Medicine	1
BMC Public Health	2
Chinese Medical Journal	1
Clinical Infectious Diseases	1
Clinics in Chest Medicine	1
Current Opinion in Allergy & Clinical Immunology	1
eGEMS Generating Evidence & Methods to Improve Patient Outcomes	1
Health Communication	1
Health Systems	1
Indoor Air	1
International Journal of Environmental Research and Public Health	1
International Journal of Medical Sciences	2
JAMIA	1
JAMIA Open	2
Journal of Bone and Mineral Research	1
Journal of Health Communication	1
Journal of Medical Internet Research	6
Journal of Occupational and Environmental Medicine	3
Journal of the American Medical Informatics Association	2
Occupational and Environmental Medicine	1
Plos One	2
Therapeutic Advances in Drug Safety	1

In addition to the 286 articles, the faculty members have published 4 textbooks that are widely used by peer institutions in the discipline.

Not only has the quantity of articles been high, the impact of these articles has also been significant. For example, Dr. Hsinchun Chen's overall h-index in 2022 is 106 (with total citations over 47,000). Several other faculty members also have high citation numbers and h-indexes as well, including Jay Nunamaker who is at 82, Joe Valacich who is at 78, Sudha Ram who is at 42, and Sue Brown who is at 38, all have citation counts over 10,000. Table E2 shows the h-index values for the MIS faculty.

Table E2: Citation counts and H-index

Faculty Member	Google Citation Count	H-index[1]
Laura Brandimarte	5060	13
Sue Brown	15266	38
Hsinchun Chen	47411	106
Wei Chen	1910	9
Faiz Currim	570	14
Yong Ge	5860	39
Matt Hashim	144	8
Gondy Leroy	3703	30
Jay Nunamaker	34485	82
Sudha Ram	26127	42
Muhammad Taqi Raza	377	11
Joe Valacich	29987	78
Seokjun Youn	10	2

[1]H-index values calculated based on Google Scholar data.

Funding

Faculty members have built successful research programs through private and public support. This support provides high visibility for the University and the College. Appendix E1 provides a list of all of the grants and contracts from 2015 to the present under each professor that has a role (PI, Co-PI, Investigator, etc.) in a particular project. Although CMI (Center for the Management of Information) is technically a separate administrative unit directed by Professor Jay Nunamaker that reports to the Dean, the funding coming to this unit is critical in the research output and reputation of the MIS Department. One of the CMI faculty and all doctoral students are full-time members of the MIS Department.

MIS faculty members led the effort to create the Cybersecurity Scholarship-for-Service at the University of Arizona (Hsinchun Chen, PI, in collaboration with ECE and Computer Science), with an initial funding of $5.3M from 2013 to 2019, and a successful renewal from 2019 to 2024 for $3.7M. MIS faculty members lead a number of large grants. Examples include:

- Health Information Technology to Support Autism Spectrum Disorders (ASD) Risk Assessment for Early Diagnosis, NIMH, $1.55M, Gondy Leroy, PI.
- CIF21: DIBBs for Intelligent and Security Informatics Research and Community, NSF, $1.5M, Hsinchun Chen, PI.
- Audio Generation and Optimization from Existing Resources for Patient Education, NLM/NIH, $1.4M, Gondy Leroy, PI.
- Evidence-based Strategy and Tool to Simplify Text for Patients and Consumers, NLM/NIH, $1.4M, Gondy Leroy, PI.

MIS faculty members also lead and participate in a number of large grants that not only span the University of Arizona, but also include other universities. Examples include:

- RIDIR: Collaborative Research: A Data Science Platform and Mechanisms for its Sustainability, NSF, 1.5M, Sudha Ram, Co-PI, with other UA units.
- RIDIR: Collaborative Research: cyberSW: A Data Synthesis and Knowledge Discovery System for Long-term Interdisciplinary Research on Southwest Social Change, 1.14M, Sudha Ram, Co-PI, with other UA units.
- Securing Cyber Space: Understanding the Cyber Attacks and Attacks via Social Media Analytics, NSF, $1.19M, Hsinchun Chen, PI, with other UA units.
- CICI: SSC: Proactive Cyber Threat Intelligence and Comprehensive Network Monitoring for Scientific Cyberinfrastructure: The AZSecure Framework, NSF, 0.998M, Hsinchun Chen, PI, with other Universities.
- SCAN Social-Cultural: Attitudinal Network Projects, MURI Multi University Research Institution, $1.7M, Jay F. Nunamaker, Co-PI, with other UA units and other Universities.

In addition, an MIS faculty member (Yong Ge) was the recipient of the first NSF Career award earned in the college. The level of research funding at the University of Arizona is the highest of any MIS department in the country (over $38M since 2015; over $120M since department inception). The diverse interests and expertise of the lead faculty members enables the funding that is used to produce the research reported in the 286 articles in 118 journals and is a key ingredient in the reputation of the department.

2. Faculty Leadership and Service

The faculty is very involved in shaping the discipline as it goes through dramatic changes. One of the most important roles undertaken by faculty members is to serve in the process that brings research to publication. The MIS faculty serve in many roles as reviewers, editors, and members of editorial and advisory boards. Appendix E2 lists the 33 major editorial roles (senior editors, associate editors, and editorial board members) that MIS faculty members have held. Some editorial roles of particular note are:

Faculty Member	**Journal**	**Role**
Sue Brown	*AIS Transactions on Replication Research*	Co-Editor-in-Chief
Hsinchun Chen	*Security Informatics*	Editor-in-Chief
Sudha Ram	*Journal of Business Analytics*	Co-Editor-in-Chief
Joseph Valacich	*AIS Transactions on Replication Research*	Co-Editor-in-Chief

Another important leadership role is through participation in the organization of professional meetings that facilitate the progress of the discipline. Appendix E3 lists the 100 major conference roles that MIS faculty members have played. Several meeting roles of particular note are presented in Table E3 (next page).

The UA MIS Department faculty members have also been recognized with top awards from the wider academic profession, another indication of their overall success and leadership in the discipline.

- Jay Nunamaker – LEO award (Lifetime Extraordinary Achievement in Information Systems), AIS Fellow
- Hsinchun Chen – IEEE Fellow, ACM Fellow, AAAS Fellow, AIS Impact Award for Research Beyond Academia
- Joe Valacich – AIS Fellow, AIS Impact Award for Research Beyond Academia
- Sue Brown – AIS Fellow

- Sudha Ram – AIS Fellow, ISS Distinguished Fellow
- Paulo Goes – AIS Fellow, ISS Distinguished Fellow
- Yong Ge – NSF CAREER Award
- Wei Chen – INFORMS ISS Gordon B. Davis Young Scholar Award

Table E3: Leading meeting roles by MIS faculty

Faculty Member	Meeting	Role
Sue Brown	Americans Conference on Information Systems (AMCIS/AIS), Minneapolis, Minnesota, August 2022.	Conference Co-Chair
Sue Brown	Americans Conference on Information Systems (AMCIS/AIS), Salt Lake City, Utah, August 2020.	Program Co-Chair
Hsinchun Chen	IEEE ISI Conference (IEEE ISI) and European ISI Conference (EISIC), 2011-present.	Steering Committee Chair
Hsinchun Chen	"ACM KDD AI4Cyber: The 1st Workshop on Artificial Intelligence-enabled Cybersecurity Analytics," ACM Knowledge Discovery and Data Mining (ACM KDD 2021), Virtual, August 2021.	Co-Chair
Yong Ge	INFORMS Workshop on Data Science, 2021.	Program Co-Chair
Gondy Leroy	14th International Conference on Design Science Research in Information Systems and Technology (DESRIST), Boston, June 4-6, 2019.	Conference Co-Chair
Sudha Ram	International Conference on Information Systems (ICIS) 2018, San Francisco, California, USA, December 13-16, 2018.	Program Co-Chair
Joseph Valacich	International Conference on Information Systems (ICIS) 2021, Austin, Texas, 2021.	Conference Honorary Chair
Joseph Valacich	The 2nd IEEE Symposium on Privacy-Aware Computing; Washington, DC, 2018.	Program Co-Chair

3. Faculty Teaching

Teaching loads and assignments are based on teaching needs and faculty interests. The process involves the faculty and supports their innovations in teaching and research. Faculty repeat courses whenever possible to provide consistency and reduce preparation requirements.

The department prioritizes teaching assignments to have full-time faculty members teach the required MIS core courses at the undergraduate and graduate levels during the academic year. Our resource plan calls for appropriate hiring to allow us to address this need consistently. Currently, there are 14 full-time tenure-track faculty, 8 full-time lecturers, and usually 4 adjuncts. Doctoral and master's students are used as teaching assistants, not necessarily to teach a class, but to support the instructor. Doctoral students often teach classes during the summer sessions. From time to time, doctoral students teach classes during the academic year. Table E4 shows the rank of the instructors for all sections taught in the past 7 years.

Table E4: Number of Faculty by Rank for Courses Taught 2016-2022

Faculty Course Load All Courses							
	2016	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Full-Time Tenure Track Faculty	17	17	17	17	17	17	15
Full-Time Career Track Faculty	7	6	5	6	6	6	8
Adjuncts	6	7	7	8	9	7	4
PhD Students	9	11	10	9	5	6	5

The regular teaching load for research-active faculty is 3 courses/year and 6 courses/year for career track faculty. The college has offered teaching reduction to some of the most active researchers who have been very successful with grants. The college also has a policy of reducing one unit of teaching load if the faculty member has an Editor-in-Chief position. Therefore, some of our top MIS faculty have reduced teaching loads as follows:

- Sue Brown 1 course/year (department head)
- Hsinchun Chen 1 course/year (EIC and successful grants)
- Jay Nunamaker 2 courses/year (0.75FTE)
- Sudha Ram 1 course/year (EIC and successful grants)
- Gondy Leroy 2 courses/year (associate dean for research)

The teaching reduction policies offer great incentives for faculty to continue to excel in their research. Although we believe these incentives need to be in place, they also impose additional challenges to the staffing of the various course sections. For example, the teaching capacity of the five research faculty listed above is currently 7 sections/year, instead of the normal 13 sections/year (considering that the normal load for the department head is 1/year).

When faculty are assigned to teach sections of courses, the department also takes into consideration the size of the sections. The course sections that we offer have great variability in the number of students they accommodate:

- The first-year level course MIS 111 has approximately 600 students per section.
- MIS 304 and OSCM 373 have over 200 students per section.
- All other courses typically have 20-60 students per section, except for doctoral seminars.

To support the faculty who are teaching the large sections, the department has adopted the following rules for the determination of the faculty teaching loads:

- Enrollments between 150 and 300 students: 1.5 teaching units. (MIS 304 and OSCM 373);
- Enrollments above 300 students: 2 teaching units (MIS 111) for every 300 students, regardless of how many are in each section.

The department utilizes student course surveys and peer reviews of teaching to evaluate the teaching quality of the faculty and uses the annual review to give faculty feedback and suggest improvements. The undergraduate and master's program committees also address issues regarding teaching quality. The Rubric for Evaluating Departmental Teaching Quality is included in Appendix G. The department is currently developing a more detailed rubric to be used as part of the annual review process.

4. Faculty Recruiting and Planned Directions for Future Hires

The number of tenure track faculty members has decreased from 16 to 14 in recent years due to tenure decisions and voluntary departures. Table E5 outlines the number of faculty at all ranks who were hired, retired, or resigned. Note that table C1 (section C) provides details for all faculty movements (hiring, promotion, resignation, and retirement) since the last review. Dr. Bin Zhang and Dr. Junming Yin were denied tenure; Dr. Zhang left in 2021 and Dr. Yin left in 2022. Dr. Lusi Yang left in 2022 to join the faculty at Georgia State University. They have not been replaced. In addition, Dr. Daniel Zeng left the University and Dr. Paulo Goes left the department to become Dean of the Eller College. As mentioned in the previous subsection, five of our top research faculty members have had their teaching loads reduced as a reward for their research and editorial prominence.

Table E5: Full-time faculty hires, retirements, resignations 2016-2022

Action Type	2016	2017	2018	2019	2020	2021	2022
Hires	2	1	0	1	2	0	2
Involuntary Resignations	0	0	0	0	0	1	1
Retirements	0	0	1	2	0	0	0
Voluntary Resignations	1	0	2	1	1	0	2

We have clearly identified the need to offer required courses for the upcoming undergraduate business analytics major and increase the number of sections of several courses in the full-time and online MS programs to be able to accommodate our own growth as well as demands from the MBA program. These programs are increasing their enrollments in specialized concentrations that are based on MIS courses.

It is imperative that the MIS Department expand the number of tenure-track faculty to continue being a top-ranked program. In academic year 2022-23, the department will offer 147 sections of courses (up from 90 sections at the time of our last review). Of these sections, approximately one-third are taught by temporary faculty (e.g., adjunct, doctoral students) or as overload. In addition, to adequately address the various teaching needs of the new programs and initiatives (undergraduate business analytics major, online certificates, growth in the online BSBA program), we need to recruit at least 2 career track faculty.

The teaching needs for tenure track faculty and career track faculty that should be addressed in the very short run (next 3 years) are listed in Table E6. As part of the hiring plan, MIS intends to pursue opportunities to increase the diversity among the faculty. In particular, and given the University's HSI designation, we intend to seek out young Hispanic scholars through participation with the PhD Project and through our personal networks. Part of the recruiting plan is to identify these individuals prior to their going on the job market to engage them in early conversations regarding the University of Arizona MIS Department and why it would be a good fit for them.

Table E6: Faculty required in short run to address faculty needs

Identified teaching need by tenure track faculty	No. tenure track	No. career track
Replacement for Bin Zhang (left in 2021)	1	
Replacement for Junming Yin (left in 2022)	1	
Replacement for Lusi Yang (left in 2022)	1	
Capacity expansion in MS programs/reduction in overload teaching	1	
Undergraduate business analytics major	1	
New initiatives (undergraduate analytics, certificates, reduction in overload teaching)		2
Total	**5**	**2**

Note that the number above may need to be adjusted depending on the upcoming tenure decision of a junior faculty member.

5. Faculty Salaries

Table E7 shows the salary data in the MIS Department in comparison to AACSB values. Given our ranking as a top 5 program, it is not unreasonable to expect that our salaries would reflect that ranking and be closer to the 90th percentile in the comparison group. We do face a significant challenge in terms of salaries for our career track faculty lagging well behind AACSB benchmarks. Given the demand for our sections and the need to hire additional faculty and lecturers, it will be critical going forward that our salaries become more competitive and reflect the quality of our program.

The MIS Department has a positive history of recruiting and retaining women faculty. We currently have about 43% (6/14) women among the tenure-track faculty. The association for Information Systems (AIS) reports approximately 33% women among their ranks[3]. Thus, MIS is doing well on this dimension. In terms of other underrepresented groups, it is important to note that only 2% of AIS members identify as Black/ African descent and another 2% identify as Hispanic. Thus, the field overall has challenges in terms of recruiting underrepresented groups to the discipline. The Eller College does participate in PhD Project events and individual faculty connect with promising young scholars from underrepresented groups who are identified through individual faculty members' personal professional networks.

Table E7: Faculty salary comparisons from the AACSB faculty salary survey

	Lecturer/Senior Lecturer/Professor of Practice	Assistant Professor	Associate Professor[2]	Full Professor
UA MIS Salaries[1]				
Mean	96	181.6	165.6	313.5
AACSB Salary Survey Comparison				
Median	99.6	175.1	198.2	251.5
25th Percentile	85.3	171.3	191.4	222.7
75th Percentile	130	178.8	203.3	273.6
90th Percentile	154.9	185.2	208.3	334.6

[3] Beath, C., Chan, Y., Davison, R. M., Dennis, A., & Recker, J. (2021). Editorial Board Diversity at the Basket of Eight Journals: A Report to the College of Senior Scholars. Communications of the Association for Information Systems, 48, pp-pp. https://doi.org/10.17705/1CAIS.04830

Notes:
[1] The mean salary figures reflect 9-month, state-funded salaries.
[2] The mean salary includes both research active and non-research active associate professors; research-active associate professors at UA average 212.5.

6. Faculty Gender and Ethnicity

The MIS department searches for the most qualified candidate for an open position and does not discriminate based on gender or ethnicity. In addition to University resources for recruiting, we send announcements to the members of our professional associations and we leverage personal contacts to ensure that we have disseminated the open position widely. The current composition of the faculty is listed in Table E9.

Table E9: Gender and Ethnicity of Faculty

Rank	Name	Gender	Ethnicity
Professors:	Sue Brown	F	Caucasian
	Hsinchun Chen	M	Asian
	Jay Nunamaker	M	Caucasian
	Gondy Leroy	F	Caucasian
	Sudha Ram	F	Asian
	Joseph Valacich	M	Caucasian
Associate Professors:	Yong Ge	M	Asian
	Matt Hashim	M	Caucasian
	Patti Ota	F	Caucasian
	Suzie Weisband	F	Caucasian
Assistant Professors:	Laura Brandimarte	F	Caucasian
	Wei Chen	M	Asian
	Muhammad Taqi Raza	M	Asian
	Seokjun Yoon	M	Asian
Professor of Practice	Faiz Currim	M	Asian
	William Neumann	M	Caucasian
Full Time Lecturers	Eyran Gisches	M	Caucasian
	Ken Gyure	M	Caucasian
	Paul Kealey	M	Caucasian
	Brandon Marshall	M	African-American
	Mark Patton	M	Caucasian
	David Weber	M	Caucasian

7. Faculty Biographical Sketches

Laura Brandimarte is an Assistant Professor of Management Information Systems at the Eller College of Management. She joined the University of Arizona after completing a PhD in Public Policy and Management and a post-doc at Carnegie Mellon University. Laura is a privacy researcher interested in behavioral aspects of privacy and security decision making. She teaches and researches issues associated with the ethics of technology. Her research focuses on factors and trade-offs affecting information disclosure; privacy risk perception; automated processing of privacy policies; spread of disinformation. Her

work has been published in leading academic journals, including *Science*, *the Journal of Consumer Psychology*, *the Journal of Experimental Psychology: General*, and *the ACM Computing Surveys*.

Sue Brown is the Stevie Eller Professor and department head of Management Information Systems in the Eller College of the University of Arizona. She joined the Eller College as an associate professor in 2005. She completed her PhD at the University of Minnesota and an MBA at Syracuse University. Prior to receiving her MBA, she worked as a programmer/analyst and IS manager in a hospital. Her research interests include individual motivations for and consequences of IT use, mediated interactions, diffusion of misinformation, and research methods. She has received funding for her research from the National Science Foundation, and other public and private organizations. Her work has appeared in leading journals in information systems and management including *MIS Quarterly*, *Information Systems Research*, *Organizational Behavior and Human Decision Processes*, *Communications of the ACM*, *Journal of Management Information Systems*, and *Journal of the Association for Information Systems*. She has served as an Associate Editor at *MIS Quarterly*, *Information Systems Research*, *Journal of the Association for Information Systems*, and *Decision Sciences* and as a Senior Editor at *MIS Quarterly.* She is currently coeditor-in-chief of *AIS Transactions on Replication Research*. She has been active in the information systems community, serving as a faculty mentor for doctoral and junior faculty consortia multiple times. She has received awards for her teaching, research, and service activities. In 2017, she was named a fellow of the AIS (Association for Information Systems).

Hsinchun Chen is a University of Arizona Regents' Professor; Thomas R. Brown Chair in Management and Technology and Director, Artificial Intelligence Laboratory; Director, AZSecure Cybersecurity Fellowship Program. Dr. Hsinchun Chen graduated with a BS degree from the National Chiao-Tong University (Taiwan), MBA from SUNY Buffalo, and an MS and Ph.D. from New York University. He is a University of Arizona Regents' Professor and the Thomas R. Brown Chair Professor in Management and Technology. He is also a Fellow of ACM, IEEE and AAAS. He received the IEEE Computer Society Technical Achievement Award in 2006, the INFORMS Design Science Award in 2008, the AIS Impact Award in 2020, and the IEEE Big Data Security Pioneer Award in 2022. He was also recognized in the INFORMS Information Systems Society (ISS) Nunamaker-Chen Dissertation Award (NCDA). The NCDA is named in honor of two University of Arizona professors, Jay Nunamaker and Hsinchun Chen, who have made significant contributions to the field of Information Systems over the past several decades. Dr. Chen has produced 36 Ph.D. students over the past 30+ years, most placed at peer Research I institutions. Three of his Ph.D. students won the prestigious ICIS ACM SIGMIS Doctoral Dissertation Awards (Z. Huang 2005, S. Samtani 2019, R. Ebrahimi 2021). Dr. Chen served as the lead Program Director of the Smart and Connected Health (SCH) Program at the NSF for 2014-2015, a multi-year multi-agency health IT research program of in the U.S. He is author/editor of 20+ books, 320+ SCI journal articles, and 220+ refereed conference articles covering artificial intelligence, digital library, data/text/web mining, business analytics, security informatics, and health informatics. His overall h-index is 105 (47,000+ citations for 600+ papers according to Google Scholar), among the highest in MIS and top 50 in computer science. Dr. Chen founded the Artificial Intelligence Lab at The University of Arizona in 1989, which has received $60M+ research funding from NSF, NIH, NLM, DOD, DOJ, CIA, DHS, and other agencies (100+ grants, 50+ from NSF, as PI). He has served as Editor-in-Chief, Senior Editor or AE of major ACM/IEEE (ACM TMIS, ACM TOIS, IEEE IS, IEEE SMC), MIS (MISQ, DSS) and Springer (JASIST) journals and conference/program chair of major ACM/IEEE/MIS conferences in digital library (ACM/IEEE JCDL, ICADL), information systems (ICIS), security informatics (IEEE ISI), and health informatics (ICSH). He is also a successful IT entrepreneur. His COPLINK/i2 system for security analytics was commercialized in 2000 and acquired by IBM as its leading government analytics product in 2011. The COPLINK/i2 system is in use in 5,000+ law enforcement jurisdictions and intelligence agencies in the U.S. and Europe, making significant contribution to public safety worldwide. Dr. Chen has served as an advisor to major federal research programs and was a Scientific Counselor of the National Library of Medicine (USA), National Library of China, and Academia

Sinica (Taiwan). He is a visiting chair professor at several major universities in China (Tsinghua University) and Taiwan (National Taiwan University). He is internationally renowned for leading research and development in the health analytics (data and text mining; health big data; DiabeticLink and SilverLink) and security informatics (counter terrorism and cyber security analytics; security big data; COPLINK, Dark Web, Hacker Web, and AZSecure) communities. His recent research includes SilverLink for mobile health and AZSecure for advanced cyber threat intelligence. Dr. Chen is director of the UA AZSecure Cybersecurity Program, with $15M+ funding from NSF SFS, SaTC, and CICI programs and CAE-CD/CAE-R cybersecurity designations from NSA/DHS.

Wei Chen is an assistant professor of Management Information Systems at the Eller College of Management, University of Arizona. His research focuses on platforms, crowds, and FinTech. His work has appeared in top academic journals including *Management Science*, *Information Systems Research*, and *MIS Quarterly*. Wei is a recipient and nominee of several Best Paper Awards in information systems conferences and workshops, and a winner of the Gordon B. Davis Young Scholar Award from the INFORMS Information Systems Society. He received his Ph.D. from the Rady School of Management, University of California, San Diego.

Faiz Currim has been with the department of Management Information Systems since 2011. Prior to that he was on the faculty at University of Iowa. He has taught classes at both the undergraduate and graduate level, including courses that introduce students to Management Information Systems and those covering Database management and Networking. He is the assistant director of the INSITE: Center for Business Intelligence and Analytics. His research interests include data analytics applications and data modeling. His work has appeared in journals such as *Information Systems Research*, *IEEE Transactions on Knowledge and Data Engineering*, *Communications of the ACM* and *Information Systems*.

Yong Ge is currently an associate professor of Management Information Systems at the Eller College of Management at the University of Arizona. He received his PhD in Information Technology from Rutgers Business School at Rutgers, The State University of New Jersey in 2013. His primary research interests include data mining, big data, machine learning, recommender systems, personalization services, social networking, target marketing, talent analytics, and business analytics. He has published 100+ journal and conference papers at both CS and IS outlets such as *IEEE Transactions on Knowledge and Data Engineering*, ACM SIGKDD International Conference on Knowledge Discovery and Data Mining, and *MIS Quarterly*. He received the NSF CAREER Award in 2019.

Eyran J. Gisches is a Senior Lecturer in Management Information Systems at the University of Arizona's Eller College of Management, where he also received his Ph.D. degree in the same discipline. He teaches Operations Management courses at the undergraduate and graduate level. His research focuses on non-cooperative decision making in Operations Management and topics such as transportation networks, queueing, and revenue management. His work has been published in academic journals in operations management and economics.

Ken Gyure is a Lecturer of Operations and Supply Chain Management (OSCM) in the Management Information Systems Department in the Eller College of Management at the University of Arizona. His courses address the overall strategic role that both operations and supply chain play in most organizations. Mr. Gyure has over 30 years of industry experience in both commercial and defense companies, most recently spending over 15 years with Raytheon Technologies as an Executive Director. He served in many senior leadership roles across both industries and has a deep knowledge of business strategy, operations strategy and implementation, and supply chain sourcing and execution. He focuses his classes on exploring real world application of OSCM concepts vs simply teaching theory. His mix of extracurricular assignments as well as in-class case study discussions prepare his students for the working world. Mr.

Gyure previously worked for Lockheed Martin, Intel, Woodward Governor, Cummins Engine Company, as well as several small startup companies. He received his BS in Electrical Engineering from Purdue University and his MBA at the University of Arizona in the full-time equivalent Weekend MBA program.

Matthew J. Hashim is an Associate Professor of MIS at the Eller College of Management, University of Arizona. His research interests include user behavior, information privacy, digital piracy, information security, and social engineering. He received his Ph.D. from the Krannert School of Management, Purdue University. His research has been published in journals such as *Information Systems Research* and *Journal of Management Information Systems* and has been presented at major conferences and workshops.

Paul Kealey has 18 years of experience in information technology and project management, including application planning and development, system design, security solutions, project guidance and leadership. He also has extensive experience working and teaching students from diverse backgrounds in both online and traditional teaching environments. Paul has an undergraduate degree from the University of Ulster in Ireland and Postgraduate degrees from the University of Edinburgh and University of Arizona. He currently teaches an undergraduate course in Business Data Communications and a postgraduate course in Information Security Risk Assessment at the University of Arizona. The Data Communications course teaches students about networks, protocols, the Internet and electronic commerce. The objective of the Risk Assessment course is to provide students with a thorough and operational knowledge of information security so that this critical area is recognized as a management issue and not an IT issue. He is also the Associate Director of the Information Assurance and Security Education Center at Eller College of Management. Designated as a National Center of Academic Excellence in Cyber Defense by the National Security Agency and the Department of Homeland Security, IASEC offers faculty, students and the community resources to study and address the cyber vulnerabilities of our nation's information infrastructure. Paul has several industry certifications in Information Security and Risk Analysis. He currently lives with his wife and daughter in Tucson, Arizona.

Gondy Leroy is Professor in MIS and Associate Dean for Research at the University of Arizona. Before coming to Eller in 2013, she joined Claremont Graduate University after earning her PhD in Management Information Systems from the University of Arizona in 2003. Her research focuses on natural language processing and machine learning with a practical and positive impact. Current example projects are the creation of an online editor for text and audio simplification and automated annotation of behaviors matching diagnostic criteria of autism spectrum disorders (ASD) in EHR. She has won grants from NIH, AHRQ, NSF, Microsoft Research, and several foundations totaling $5.7M as principal investigator, and another $2.1M as co-investigator. She earned a BS/MS degree (1996) in experimental psychology from the University of Leuven (1996) in Belgium and a MS (1999) and PhD (2003) degree in management information systems from the University of Arizona. In addition to her research, she wrote the book "Designing User Studies in Informatics" (Springer, 2011) and is an active contributor to increasing diversity and inclusion, e.g., through her "Tomorrow's Leaders Equipped for Diversity" program at the Eller College of Management.

Brandon Marshall is a lecturer in the department of Management Information Systems (MIS) at the University of Arizona. He completed his Masters at the University of Arizona's College of Education in Language, Reading, and Culture in 2005. He's currently in the final stages of completing his Doctoral degree in Language Reading and Culture with a research interest in student -athlete identity and its impact on personal and professional success. Prior to coming to MIS he served on multiple committees (NCAA Equity and Student Athlete Well-Being, UA, Fall 2006; Intercollegiate Athletics Environment Panel, UA, Fall 2005; Search Committee for Director of African American Student Affairs, UA, Fall 2005; and Search Committee for Head Football Coach, UA, Fall 2003), and served as the interim Co-Director of African American Student Affairs.

Bill Neumann is a Professor of Practice in the Management Information Systems Department in the Eller College of Management at the University of Arizona, and holds a doctorate in Computer Science and Engineering from Arizona State University. Along with his role as the course coordinator for MIS 111, Dr. Neumann explores active learning pedagogy and technology innovations within the MIS Department, in collaboration with the University's Honors College and General Education curriculum, and as a University representative on the state's Transfer Credit & Articulation Committee. Complementing his with curricular role, Dr. Neumann works to advance the professional and career development and advancement opportunities for Career Track faculty at the university. Academically, Dr. Neumann investigates strategic planning, implementation and integration of value chain management systems, and information security risk management technologies provide innovative solutions for enhancing the effectiveness of a corporation's business operations. Dr. Neumann leads range of outreach programs including the inaugural GenCyber program for secondary students interested in cyber security, and, more recently directing the department's outreach to native students in the Eller college through the Chen-Chow Bear Down Scholars program. Prior to joining the University of Arizona, Dr. Neumann held a variety of positions in industry with Honeywell Information Systems, Inter-tel Communications and Global Atmospherics, as well as ongoing work consulting in data communication, enterprise systems, and information security management.

Jay F. Nunamaker, Jr. received his BS degree in Mechanical Engineering and MS degree in Industrial Engineering from the University of Pittsburgh. After graduating as a Mechanical Engineer, he worked at the Shippingport Atomic Power Plant Station as a Test and Design Engineer for 3.5 years. He received a BS from Carnegie Mellon University and his PhD in Operations Research and Systems Engineering from Case Institute of Technology of Case Western Research University. He continued his academic Career as a Research Assistant on the ISDOS project at the University of Michigan and then became an Associate Professor of Computer Science and Industrial Administration at Purdue University. Nunamaker is currently the Regents and Soldwedel Professor of MIS, Computer Science and Communication and the Director of the Center for the Management of Information (CMI) at the University of Arizona. He founded the MIS department at the University of Arizona in 1974 and served as Department Head for 18 years. He is the Director Emeritus of the Center of Excellence of Border Security and Immigration. Nunamaker received funding from IBM, DEC, NCR, NSF, US Army, US Navy, and US Airforce. He received his professional engineer's license in 1965. Forbes Magazine featured Nunamaker in the July 1997 issue as one of eight key innovators in information technology. He is widely published with over 30,000 citations to his research. He has produced over 400 journal articles, book chapters, books and referred proceedings. He has an h-index of 83. The Hawaii International Conference on System Sciences recognized Nunamaker in January 2017 as the most prolific author at HICSS over the past fifty years. Nunamaker has received more than 100 million dollars as the PI or Co-PI on sponsored research at the University of Arizona, Purdue University, and the University of Michigan. His specialization is in the fields of system analysis and design, collaboration technology, deception detection and security, including cybersecurity. He has founded five spin-off companies based on his research. The commercial product, ThinkTank of GroupSystems Inc., based upon Nunamaker's research, is often referred to as the gold standard for structured collaboration systems. He has served as Major Professor for over 100 PhD students with placements at Harvard, University of Michigan, University of Florida, and Texas A&M University. He is currently working on the development of an AVATAR/Kiosk for screening subjects at a border checkpoint or any activity that assesses the risk of an individual. The Association of Information Systems (AIS) elected Nunamaker a fellow in 2000. He received the LEO Award for Lifetime Achievement from AIS at the International Conference on Information Systems in December 2002. Nunamaker also served as Chairman of the Association for Computing Machinery Curriculum Committee on Information Systems from 1976-1991 and as a committee member from 2009-2014.

Peggy (Patti) Ota is an Associate Professor in Management Information Systems in the Eller College of Management at The University of Arizona. She received her PhD in Computer Science from the University

of Pennsylvania in 1971, a Masters in Electrical Engineering from the University of Pennsylvania in 1969, and an AB in Mathematics from Cornell University in 1966. She began her academic career at Lehigh University as the first female faculty member in the College of Engineering and Physical Sciences in the Department of Electrical Engineering. Shortly after receiving tenure, Dr. Ota began serving in a series of administrative positions at Lehigh, including vice provost, interim provost (two times), and dean of the College of Business and Economics. While at Lehigh, she received the most prestigious teaching and service awards. In 1999, Dr. Ota came to The University of Arizona and served in several vice presidential positions, including vice president for executive operations and associate to the president and vice president for enrollment management. She has served as Pennsylvania state coordinator for the American Council on Education National Identification Program for the Advancement of Women in Higher Education, on the Advisory Committee for Engineering for the National Science Foundation, as chair of the Committee on Equal Opportunity in Science and Engineering for the National Science Foundation, as a member of two AACSB accreditation teams, and a consultant in enrollment management for several universities. Currently, Dr. Ota is teaching Python programming, Enterprise Management Systems, and a general education course in Problem Solving.

Mark Patton is a Senior Lecturer in Management Information Systems and the AZSecure Program administrator for the SFS (Scholarship for Service) and SFI (Scholarship for Industry) cybersecurity programs in the Eller College of the University of Arizona. He completed his PhD at the University of Arizona in 2009 and his MBA at the Ross School of Business in 1999. He has undergraduate degrees in Engineering and Computer Science at the Montana College of Mineral Science and Technology and is a registered Professional Engineer. He has taught courses in the undergraduate and graduate (masters) level programs and mentors master's level students executing Cybersecurity Research. Prior to receiving his PhD he worked in eBusiness Strategy Consulting and prior to receiving his MBA he served as a Senior Engineer and a Supervisor in the Mining Industry. He has ongoing interests in cybersecurity, data analytics, machine learning, credibility assessment, organizational efficiency, and organizational simulation.

Sudha Ram is the Anheuser-Busch Chair in MIS, Entrepreneurship and a Professor of Management Information Systems in the Eller College of Management at the University of Arizona. She has joint faculty appointments as Professor of Computer Science, member of BIO5 Institute, and Institute for the Study of Plant Earth. She is the director of the Advanced Database Research Group (ADRG) and INSITE: Center for Business Intelligence and Analytics at the University of Arizona. Dr. Ram received a PhD from the University of Illinois at Urbana-Champaign in 1985. Her research is in the areas of Enterprise Data Management, Business Intelligence, Large Scale Networks and Data Analytics. Her work uses different methods such as machine learning, statistical approaches, ontologies and conceptual modeling. Dr. Ram has published more than 200 research articles in refereed journals, conferences and book chapters. Her research funded by the Library of Congress and the National Science Foundation has resulted in the development of the W7 model for data provenance which has been widely adopted for use in Raytheon Missile Systems, SAP, and Ford. She was a co-investigator of the iPlant Collaborative funded by NSF. Her research has been funded by organizations such as, IBM, Intel Corporation, SAP, Ford, Raytheon Missile Systems, US ARMY, NIST, NSF, NASA, and Office of Research and Development of the CIA. Dr. Ram served as the senior editor for *Information Systems Research*, and is on the editorial board for many leading Information Systems journal and currently a co-editor in chief of the *Journal on Data Semantics* and Editor-in-Chief of *Journal of Business Analytics* She is a cofounder of the Workshop on Information Technology and Systems (WITS) and serves on the steering committee of many workshops and conferences including the Entity Relationship Conference (ER). Dr. Ram has published articles in such journals as *Communications of the ACM*, *IEEE Expert*, *IEEE Transactions on Knowledge and Data Engineering*, *Information Systems*, *Information Systems Research*, *Management Science*, and *MIS Quarterly*. Dr. Ram was named an AIS Fellow in 2018 and an ISS Distinguished Fellow in 2021.

Taqi Raza is an Assistant Professor at the MIS department of the University of Arizona. His research interests are broadly in mobile networked systems, with a recent focus on building practical systems to improve the security and availability of the quantum networks, industrial control systems, and cloud-based 5G cellular networks. His research has appeared in several selected journals: IEEE Transactions on Information Forensics and Security, IEEE Transaction on Selected Areas of Communication, IEEE Transactions on Networks and Service Management, and many others. Taqi has won a number of NSF grants as a sole PI and is also part of NSF Center of Quantum Networks. His research is also supported by Arizona Technology and Research Initiative Award, and the Quantum Network fellowship. Prior to joining the University of Arizona, Taqi received a PhD in Computer Science from UCLA in 2019 with PhD Dissertation Year Award.

Joseph (Joe) S. Valacich is the Munsinger Professor of Entrepreneurship and Innovation, Professor of Management Information Systems and Associate Professor of Systems and Industrial Engineering at the University of Arizona. He is the Board Chairman, Co-founder, and Chief Science Officer (CSO) of Neuro-ID, Inc. Joe's primary research focus is on human-computer interaction (HCI), cybersecurity, and e-business. He has several hundred academic publications in leading journals and conferences. Google Scholar lists his citation counts at more than 30,000, with an h-index of 78. He has multiple issued and pending patents focused on analyzing fine-grained HCI data to infer user intent, confidence, bias, and emotional state. In 2014, he co-founded Neuro-ID, a company that delivers real-time behavioral analytic solutions that combat online fraud, increase conversion rates, and improve customer experiences. Neuro-ID has obtained nearly $50M in investment, from both individual and institutional investors, and helps ensure seamless digital customer experiences across a variety of industries and works with leading brands including TransUnion, FICO, VISA, Intuit, Plaid, Square, Affirm, Alloy and Elephant Insurance among many others. In addition to his scholarship and entrepreneurial activities, Dr. Valacich is an award-winning teacher and a co-author on multiple leading computing textbooks. He has also chaired and served on multiple model curriculum and accreditation task forces for both undergraduate and graduate computing programs. Lastly, he has played key leadership roles in the creation of online education programs at both Washington State University and The University of Arizona. Dr. Valacich is a *Senior Member of the National Academy of Inventors* (2020), a *Distinguished Alumnus of the University of Montana* (2012), an *Outstanding Alumnus of the College of Business Administration* at the University of Montana (2009), and a *Fellow of the Association for Information Systems* (2009). In 2021, he was awarded the *Association for Information Systems* (AIS) Impact Award, to recognize the influence of his research beyond academia. In 2020, *Tech Launch Arizona (TLA),* the University of Arizona technology transfer and commercialization group, named Neuro-ID the I-Squared (Innovation and Impact) *Startup of the Year* (out of more than 100 startups in their ecosystem). In 2016, *TLA* named Dr. Valacich the I-Squared *Inventor of the Year* for Information Technology.

David Weber is a Senior Lecturer in the Management Information Systems Department in the Eller College of Management at the University of Arizona. Dr. Weber's work addresses IT for development, microfinance, eSports, databases, programming, and data mining. Prior to joining the University of Arizona, Dr. Weber was on faculty at Northern Arizona University and held positions with Nova Engineering and L3 Communications. He worked at an international boarding school in India and served as a volunteer with NightLight International, a Thailand-based NGO that provides skills and job training for survivors of human trafficking and sexual exploitation. He currently serves as the secretary of their board of directors. He has led six study abroad programs to Central Europe and Southeast Asia.

Suzanne (Suzie) Weisband is an associate professor in MIS in the Eller College of Management. She received her PhD in social and decision sciences from Carnegie Mellon. Her work focuses on collaboration and coordination in online, distributed work contexts. Dr. Weisband applies behavioral and social science

techniques and theory to understanding people and their use of technology. Her teaching focuses on systems analysis and design for both undergraduate and graduate students.

Seokjun Youn joined the University of Arizona in Fall 2019 as an assistant professor after earning his PhD in Business Administration, specializing in Operations and Supply Chain Management, from Texas A&M University. To date, his research centers on healthcare operations and healthcare analytics. Applying both empirical and optimization methodologies, he investigates the operational drivers of healthcare delivery performance to understand the impact of public policies and technological innovations on the management of healthcare operations. In additional areas of distinction, he is also specialized in research on supply chain logistics and platform business models. He is a member of the Institute for Operations Research and the Management Sciences (INFORMS), the Production and Operations Management Society (POMS), the Decision Sciences Institute (DSI), and the Association for Information Systems (AIS).

F. UNIT ADMINISTRATION

1. Department Organization

The MIS Department is organized along the lines of most academic departments. The department head, who is reviewed every 5 years, is a faculty member, leader, and administrator. The department head reports to the Dean and the faculty report to the Department Head within the context of University, College, and Departmental faculty governance and processes. This includes an elaborate committee structure at the department and college level. All nonfinancial aspects of curriculum are decided by faculty.

The standing departmental committees include:

1. **Annual Performance Review Committee.** This is a 3-member committee of tenured faculty elected annually by the MIS faculty. It is responsible for appraising the annual performance of the entire full-time faculty, including the department head, and providing feedback to individual faculty members and the department head. In addition to conducting performance reviews, the Committee may also advise the Department Head on other matters of concern to the Faculty.
2. **Promotion and Tenure Committee.** This committee consists of three tenured full professors and is assembled by the department head to evaluate faculty cases of 3-year reappointment, promotion, and tenure. In addition, this committee will have an external non-voting representative from the College Faculty Status Committee who sits in as an observer. The Department Head selects a tenured Full Professor **not** on this committee to represent the Department on the College Faculty Status Committee.
3. **Undergraduate Studies Committee** deals with academic and curricular policies and issues related to undergraduate programs and courses. The committee chair or another voting member of this committee also sits on the college-wide undergraduate studies committee.
4. **Master's Program Committee** deals with academic and curricular policies and issues related to master's programs and courses. The committee chair or another voting member of this committee also sits on the college-wide graduate professional studies committee.
5. **Doctoral Program Committee** deals with admissions, student reviews, student issues and curriculum of the PhD program. A member of this committee also represents the department at the college level Research and Doctoral Studies committee.

Other committees and task forces are formed as necessary. In addition to the above, the department has representatives on the College Advisory Committee (CAC), chosen by a vote of the faculty. Also, the department is represented on the Eller Executive Education Committee with one voting member and on the Diversity, Equity, and Inclusion Committee with one voting member. Both are chosen by the department head in consultation with the faculty.

There are several research labs and centers in the Department — AI Lab, Advanced Database Research Group, AZ Secure, Center for the Management of Information (CMI), Center for Business Intelligence and Analytics (INSITE) — that are staffed and managed by individual faculty members. Other classified staff who report directly or indirectly to the department head are detailed below.

The MIS Department also houses and maintains the McKeever Family Foundation Lab (previously the MicroAge Lab), which is used to support the teaching efforts of the department and the Eller College. The lab consists of 53 laptops in a classroom and the MIS Commons, a space utilized by all graduate students in the College for meetings and project work. The MIS Commons has 4 work tables for small conferences equipped with power and flat panel displays and other seating with power for student devices. The MIS Academic Research and Technologies Group (ARTG) maintains high performance servers, storage and

networks to support the teaching of specialized software and applications. These resources are also used for student projects, and to a limited extent, faculty research. The ARTG maintains software license agreements to benefit students in the MIS Department, Eller College of Management, and the University. The administration of the lab and its resources are under the MIS ARTG, with full-time director John Moeller and full-time assistant director Patrick Brown. The ARTG employs 40 hours per week of graduate assistants and 20 hours per week of student workers to assist with their operations and projects.

2. Classified Staff

The classified staff consists of two groups:

- Support for the departmental operations and academic programs.
- Support for research faculty and centers.

Table F1 provides information about roles, characteristics, and reporting structure of the current staff.

Table F1: Staff roles and reporting structure

Name	Group	Title	Gender	Ethnicity	Reports to
Bishop, Dawn	Operations Support	Human Resources Representative	F	Caucasian	Rebecca Ramos
Brown, Patrick	McKeever Family Foundation Lab	Assistant Director, Academic and Research Technologies Group	M	Caucasian	John Moeller
Dietsche, Erin	Operations Support	Coordinator, Communications & Events	F	Caucasian	Rebecca Ramos
Edmonds, Lyndsey	MS Program Support	Associate Director, MIS Career Management	F	Caucasian	Wendy Wienhoff
Gaulin, Brandi	AI Lab Group	Assistant Director, AI Lab	F	Caucasian	Hsinchun Chen
Goetten, Jody	CMI Operations Support	Administrative Support Assistant III	F	Caucasian	Rebecca Ramos
Greengaard, Alexander	MS Program Support	Assistant Director, MIS Academic Operations	M	Caucasian	Wendy Wienhoff
Martinez, Maria (Candy)	Operations Support	Accountant, Senior	F	Hispanic	Rebecca Ramos
Moeller, John	McKeever Family Foundation Lab	Director, Academic and Research Technologies Group	M	Caucasian	Sue Brown, Dept. Head
Mora, Natalie	Online Programs	Program Coordinator	F	Hispanic	Bryn Pallette
Neumann, William (Bill) [1]	MS and Undergrad Programs	Director (Part of duties as Professor of Practice)	M	Caucasian	Sue Brown, Dept. Head
Pallette, Bryn	Online Programs	Director, MIS Online Programs	F	Caucasian	Sue Brown, Dept. Head
Prewitt, Pamela	Operations Support	Administrative Support Assistant I	F	African-American	Rebecca Ramos
Ramos, Rebecca	Operations Support	Administrative Manager	F	Hispanic	Sue Brown, Dept. Head
Sudhaus, Paulo	Undergrad Programs	Coordinator, Academic	M	Caucasian	Bill Neumann

Van Winkle, Cinda	MS Program Support	Program Coordinator, Senior	F	Caucasian	Bryn Pallette
Wienhoff, Wendy	MS Program Support	Director, MIS Career Management	F	Caucasian	Sue Brown, Dept. Head

Notes:
[1] Bill Neumann is not classified staff. He is shown in this table to reflect his support role for the department's programs.

Several other support jobs for the department and the centers are staffed by graduate and undergraduate students (for example, research assistants, teaching assistants, reception desk, special projects, etc.).

3. Adequacy of Staff Support

We have taken a very conservative approach to staffing our programs. We have one academic advisor and one half-time admissions coordinator for the main campus students (both MS MIS and MSBA). The half-time admissions coordinator also processes inquiries and applications for our PhD program. We have two individuals who serve in the admissions and advising roles for the online programs. We have two career services staff who primarily serve the main campus students but will provide guidance for online students who request it. The career services team is extremely understaffed, given all that they are doing. As a point of comparison, the MBA program has one director and four success coaches versus MIS' one director and one assistant director. The MBA team serves the one-year Marketing Program (approximately 30 students), the one-year Finance Program (approximately 35 students), the online Healthcare Management (MHM) Program (approximately 74 students), and the full-time MBA program (approximately 55 students across both cohorts, of which MIS Career Services Team works with the 20 TLPs). The MBA team also serves their online, evening, and executive students as requested, with evening and executive comprising about 200 students and online about 300 students. If we assume 10% of the part-time (online, evening, and executive) students seek assistance, the total number of students served is approximately 180 to 200. *Thus, MBA's career services team has a staff to student ratio of about 1:40*. With a first-year cohort of 95 (MS MIS+MSBA) and a third semester cohort of 70, plus 10% of the roughly 200 online students, *the ratio in MIS is about 1:90*. This is not sustainable, particularly since the director of MIS Career Services is also managing alumni and corporate relations. An additional team member is needed to enable Career Services to meet their goals.

Since the last review, funding for the graduate programs in MIS has largely shifted to the college. At the time of the last review, MIS provided complete funding for the staff to support the programs; MIS also received a significant amount of revenue sharing to fund the positions. This arrangement has changed so that personnel expenses directly associated with each program are, for the most part, allocated to the program and thus funded by the College. The final steps in this process are being implemented this fiscal year.

Since the last review, the staff has grown to include one additional career services employee and one additional online admissions coordinator/advisor. Both were deemed necessary due to the steady state 85-95 new students each year for the MS MIS program and the steady state growth of *MISOnline* as well as the addition of an online MS Cybersecurity program. Our admissions coordinator for campus programs was reduced to half-time, which has increased the workload for the academic advisor. The department did not increase staff size with the addition of the MSBA program, which has so far been alright, given that the program's size has remained small. As the MSBA program grows, we anticipate the need for additional staff to support the advising and career management needs of the additional students.

In terms of the operations support staff in the department, we remain under-staffed here as well despite increasing our headcount since the last review. We have made the strategic investment to have one staff member dedicated to events and communications, while most other departments do not have a full-time staff member assigned to perform these functions. For MIS, it is necessary largely to support the events associated with donor-funded initiatives (e.g., Zipperman Scholars, Chen-Chow Bear Down Scholars, and Advanced Zipperman Associates), in addition to the various orientation, training, and career events held to support our graduate students.

In terms of financial and human resources operations, the department is under-staffed. By way of metrics, the department processed about 1200 financial transactions last year (between MIS and CMI). The reason for this volume of transactions is that the department is home to two undergraduate business majors, four master's programs, and one PhD program that is larger than typical MIS PhD programs due to grants. In addition, the department generates millions of dollars in research funds, leading to the need to manage research fund expenditures. Finally, the department hires a large number of students and facilitators to work on grants and assist with teaching. The next highest academic department/school's transaction volume is the School of Accountancy at 543. When it comes to human resources transactions, the department processed about 800 last year (between MIS and CMI). The next highest academic department's volume for this is Economics at about 475. None of these numbers include the transactions associated with submitting grants, for which MIS also has the largest volume. MIS currently has four personnel dedicated to reception, human resources, and financial transactions. Economics has the equivalent of 2.6 personnel dedicated to these tasks (just under 1000 transactions in total) and Accounting has 2 personnel for just under 850 transactions. Although we recognize that there are other elements to the positions in all departments, comparing just these transactions would suggest that MIS needs one additional employee to balance the workload for administrative activities.

We conducted a survey of the staff (see Appendix F). About 80% of the staff responded to the survey. First, we'll start with the positive. About 90% of the staff indicated that they have sufficient opportunities for professional development and training and the same percent feel that they are treated with respect in the department. Happily, 100% of the staff feel the department has a positive and collegial work environment and the same percent believe the department is moving in the right direction. The remainder of results are largely consistent with our assessment. Specifically, 70% of the respondents indicated that the department does not have enough staff to support programs and faculty. Although a little over 65% feel their salaries are competitive in the college, only 20% believe that's true with respect to the rest of campus. This is not surprising, as we recently lost a staff member who reported that their new position was the same level, but the salary was higher in a different college. Finally, there was great diversity in response to the question regarding staff ability to truly unplug on vacation; just under 50% disagreed with the statement and about 35% agreed with it. This is worrisome as vacations are supposed to be important to help fend off burnout. This is echoed in the open-ended comments — "the level of understaffing makes us more susceptible to burnout." This is exacerbated when staff hear senior leaders say, "we have to do more with less," as shared in one of the comments. Staff do express an interest in more remote/hybrid work and would appreciate having opportunities for advancement *in* the department. Despite the challenges around salaries and staffing levels, it was nice to see that the staff are happy in MIS, saying "I'm grateful to work here," "the MIS department is a great place to work," and "MIS is the best department in Eller to work for!!"

In summary, the MIS department is a highly efficient and operationally lean operation. Any increase in student enrollments will have an impact on the current staff and will require us to expand the staffing levels to be sure that students get the time and attention they need. In comparison to our peer departments/units in the Eller College, the overall department is currently understaffed.

G. UNIT RESOURCES

1. The Budget

For several years, the budget situation of the University of Arizona has been precarious. The historic lack of funding by the state for higher education was significantly impacted as a result of the recession and there have been no attempts from the state to return funding to pre-recession levels. As a consequence, the university, the college, and the department have experienced shrinking budgets and fiscal uncertainty. Until recently, raises had been, by and large, nonexistent. The Eller College has faced multiple years of running a deficit, which means that revenue sharing with the departments has been extremely limited.

Prior to fiscal year 2020, the MIS Department was the recipient of its fair share of revenue generated from its programs. Since then, revenue sharing in the college has favored summer revenue. With MIS' involvement in our online programs as well as the college online undergraduate and MBA programs and our large on-ground program, we have tended to not offer as many large enrollment courses in the summer. Thus, despite generating a significant amount of revenue for the college, we received very limited revenue sharing. Luckily, MIS had a very healthy reserve. Unfortunately, at the end of fiscal year 2023, it will be fully depleted. Eller's budget is projected to continue being in the red. If this is not rectified, it will likely impact the department's ability to offer summer support or additional travel support for the tenure-track faculty. It will also likely mean a reduction in professional development for the staff and recruiting opportunities for the students. It will also mean a reduction in student services. Together, these changes could lead to a negative impact on our rankings, student recruiting efforts, and faculty recruiting and retention.

The MIS Department continues to be committed to generating additional revenues for the college and the department. Specifically, we generate funds through:

- Program revenues. Our graduate programs offer very little in the way of scholarships or tuition reduction, which means that the programs – on campus and online – generate significant net revenue for the college. A recent calculation indicated that our break even for the MS MIS main campus program was 47 new students; we have 85 new students in Fall 2022, almost 40 above breakeven. Due to deficits at the college, we have received very little in the way of revenue sharing in recent years. The college opted to reward summer and winter classes (of which we teach very little), rather than master's and online programs due to the limited funds available. We are optimistic that the internal budget model revision will once again recognize and reward our activity, however revenue sharing will require the college to have a positive net revenue.
- Indirect Costs (IDC) from research grants. Currently, a little over 12% of the IDC comes back to the department. The department splits that amount with the PIs in order to further incentivize faculty to pursue funded research. Under the new budget model, the amount returned to the college will increase. We are having internal discussions regarding the new internal revenue sharing model, as the distributions to the college have changed. We anticipate a slight increase in the amount shared with the department, which will subsequently increase the amount provided to the PI.
- Gifts and donations. The MIS department has been able to secure annual gifts from a few loyal donors, including members of the Advisory Board. Some of these funds can be spent in a discretionary way; other gifts are used to support specific programs, such as the Zipperman Scholars Program and the Chen-Chow Bear Down Scholars Program.

The funds above have been used in the following ways, which are not covered in any way by the university/college budget:

- Research and travel support for the faculty. At the time of the last review, the research faculty received $4,000 and the career track faculty received $1,500. In 2014, the amount for tenure track faculty was increased to $6,000. In 2018 and 2019, the college provided funding of $6,000 for the tenure track and $1,500 for the career track faculty. From 2020 onward, the amount provided by the college was cut in half ($3,000 and $750), with the department providing the remainder of the funding.
- Salaries of staff. We have been covering the salary for the half-time admissions coordinator, one-half of the salary of the senior accountant, raises that were given to two of the staff, one-half of the salary for the AI Lab manager, and one-half of the salary for technology support for the AI Lab. Beginning this year, the college will cover the admissions coordinator and the staff raises. The department will continue to cover the remaining staff costs.
- Technology replacement: all desktops, laptops, printers, servers, etc. for all faculty and staff, on roughly a 4-year cycle, as needed.
- Furniture replacement and office beautification projects.
- Partial salary for summer support of assistant professors during the second 3 years of employment to top-up the competitive college funds.
- Partial summer support for research active associate professors to top-up the competitive college funds.
- Moving and visa expenses for new faculty.
- Support for the career services team to send students to recruiting events, offer career treks to companies, offer alumni events, and obtain their own professional development. It has become increasingly important that we offer these services to the students and the team, as similar levels of support are offered to the MBA students and staff. The importance of this is heightened as our students are increasingly in classes with the MBA students (e.g., TLP students), and our staff works collaboratively with the MBA staff.
- Graduation receptions offered in December and May to recognize our students, with the December event particularly important as the majority of our students complete in December and the University has discontinued the fall graduation events.
- Alumni events sponsored by the department.
- Swag and other promotional items for the department, as well as conference sponsorships.
- All operating expenses: office supplies, equipment leases, etc.
- Other expenses that come up during the year.

2. Teaching Resources

Faculty

As mentioned in Section E, our faculty size has reduced, despite increasing the number of courses we are offering. At the time of the last review, we offered 90 sections of courses per year; today we offer closer to 150 sections per year.

Our faculty continues to be exceptionally productive in research and outreach. Because of very successful grant activities, two of our top faculty (Chen and Ram) were offered teaching reduction (from 3

courses/year to 2 courses/year). One of our faculty members is on a reduce workload of .75 (Nunamaker). We currently have two faculty members who are Editors-in-Chief in journals (Chen and Ram). They also get an additional one course teaching reduction. One of our faculty members is the Associate Dean for Research for the college (Leroy), which provides a one-course teaching reduction. In addition, faculty do have the opportunity to "buy out" of teaching with grant funds, and we have one faculty member who is doing that (Leroy). The department head (Brown) has a two-course reduction. These various teaching reductions have had an impact on our teaching capacity.

A low-cost solution for generating more teaching capacity is to use more career track faculty. We have pursued this alternative, hiring 3 lecturers in the last 3 years. We have also used the recourse of covering our teaching needs with adjuncts and doctoral students and asking faculty to teach overloads. We currently have about one-third of our MS classes covered by temporary faculty (i.e., industry practitioners serving as adjuncts and PhD students as part of their professional development) or being taught on overload. This is not sustainable. Being a top 5 program means having an established fabric of research faculty creating and disseminating knowledge in the classroom and interacting with the students on a continuous basis. Our faculty size limits our ability to be innovative and creative in offering new courses to respond to the changing information systems market.

Teaching Assistants

The department utilizes a good number of graduate teaching assistants. They are absolutely necessary in the extremely large sections of MIS 111, MIS 112, MIS 304, and OSCM 373. The department also has a rule of assigning one 10-hour a week GTA to every course section above 30 students. This is also absolutely necessary because our courses rely on very important hands-on software components. The additional support provides much-needed assistance to the students and enhances the learning experience.

Funding for GTAs comes from the college. With the recent raise in the graduate student salaries and the ongoing deficit suffered by the college, there is increasing pressure to reduce the GTA budget. The MIS Department was asked to reduce our GTAs by 20%. This was simply not possible without impacting the quality of our teaching. The College has been very supportive and acknowledged that further cuts will have a negative impact on our programs.

Technology Infrastructure

On the second floor of McClelland Hall, we have the McKeever Family Foundation Lab (Micro-Age classroom at the time of the last report), which is the center of our technology infrastructure to support MIS teaching. Jeffrey McKeever, owner and president of MicroAge, donated the initial funds to refurbish the space in 2012. In 2018, he once again provided the funds to refresh the technology, with the college and the department funding the physical space renovations. According to the original agreement, the space will be refreshed again in 2023.

The lab consists of 53 laptops in a classroom and the MIS Commons, a space utilized by all graduate students in the college for meetings and project work. The MIS Commons has 3 work tables for small conferences equipped with power and flat panel displays, and other seating with power for student devices. The MIS Academic Research and Technologies Group (ARTG) also maintains high performance servers, storage, and networks to support the teaching of specialized software and applications. These resources are also utilized for student projects, and to a lesser extent, faculty research. The ARTG maintains software license agreements to benefit students in the MIS Department, Eller College of Management, and the University. The administration of the lab and its resources is under the MIS ARTG, with full-time director John Moeller and full-time assistant director Patrick Brown. The ARTG employs 40hours/week of graduate assistants and 20hours/week of student workers to assist with their operations and projects.

3. Research Support

The general research environment in the MIS Department is very good. We have a good number of senior research professors with very active research agendas, and multiple top-notch research centers that are engaged in leading-edge research. Opportunities for research collaboration abound. There are, however, some research support issues that if addressed will further elevate the research prominence of the department:

- Guaranteed summer research support to productive research faculty throughout their careers. This has become common practice among our peer institutions. Currently, the support is available for the first three years. Competitive summer support is available for assistant and associate professors, but full professors are not allowed to compete for these funds.
- Access to PhD students. The department needs to build a pool of PhD students that are not funded directly by grants through the research labs, so that (especially) junior faculty could have access to develop research relationships with them. That effort was started at the time of the prior review but has been sporadic due to the limited number of qualified applicants, the number of students needed on grants, and the need to provide funding for students who rotate off grants.
- Additional research and travel funding. With inflation and an increasing number of relevant conferences in the discipline, $6,000 is low for travel funding. Our premier conference is outside of the US two out of every three years, which increases travel costs. In addition, conference registrations are rising as are the costs of professional memberships.

4. Physical Space

We have been fortunate to have recently had our office space updated. In the summer of 2022, the carpets (from 1991) were replaced, offices painted, and our reception area updated. In 2019, we received Provost Investment Funds that allowed us to create a cybersecurity operations center, an IoT (Internet of Things) lab, and student work areas in the AZSecure space on the first floor. And, as discussed above, the McKeever space was upgraded in 2018. The good news is that the spaces provide modern work centers expected of a top-ranked program.

The challenge we face, which is not unique to our department, is that our current office space has been maximized. We have two employees who are 100% remote. One of those employees intends to retire, and we will bring the position back in-house when we hire the replacement. We have run out of office space for staff positions. Most of these positions are student facing, which means they need a private office in which to engage in one-on-one student academic advising and career conversations.

The other challenge we face is limited space for students and any new research labs. The college has recently opened up some rooms for graduate students to use to work on their team projects, have client meetings for their consulting projects, and participate in online interviews. There are simply not enough of these spaces for the number of graduate students we have in Eller. In addition, although we have a large cubicle space for our PhD students, there is limited space in the building for any new research labs that might be needed to support future grant activity. This is not a new problem, nor is it unique to MIS. We need to start thinking more creatively about our space usage in order to address these challenges.

5. Administration Support

As described in Section F (Unit Administration), we are understaffed, considering the size and number of programs we have beyond the traditional undergraduate program. Although our staff size appears large

compared to other academic units, the combination of research activity, four different master's programs, and a large doctoral program results in the need for additional staff. The department processes nearly 2000 transactions per year, which is more than double that of other academic units in the Eller College.

6. Departmental Changes to Increase Efficiency

We have worked diligently to streamline the department's operations. Specifically, we have changed the reporting structure of the unit, such that four of the staff report directly to the head, and each of those individuals has one to four direct reports of their own. Each staff member has created a "notebook" that lists the tasks associated with their position and the timing in which they need to be completed. This has been tremendously valuable with staff turnover, which we have experienced a fair amount of recently. For department operations, we have created a single email account that enables the administrative manager to see what work needs to be done, allocate it appropriately, and ensure that it gets completed.

Our faculty have been creative in their teaching. As enrollments have increased in some courses (i.e., MIS 111, MIS 304, OSCM 373) to the point that they exceed room capacity, faculty have embraced flipped classrooms to enable students to obtain course content while not having to be in the classroom. With every other class attendance, the overall class size appears smaller to the students and enables the instructors to develop better relationships with the students.

Some instructors have been able to engage students in critical thinking and alternative learning opportunities by leveraging course technology in more significant ways. In MIS 111, for example, D2L is used to not only to administer and grade exams at scale, but also to share personalized feedback on written project assignments and reminder "nudges" to foster student success and retention. With nearly 2000 first-year students in the course in fall 2022, effectively leveraging technology is essential to being able to deliver an individualized classroom learning experience at scale. In addition, these strategies have translated well into the online instructional space and have allowed MIS 111 Online, which is also the introductory course in the Eller Online undergraduate program, to scale efficiently in two academic years from 27 to 52 to over 300 students this semester with no additional faculty and only limited incremental hourly grading support.

We have also piloted an online teaching model that relies on the expertise of a tenure-track faculty member to curate course content and oversee grading but frees up their time during the course offering by leveraging graduate (doctoral) student support for grading and student interaction. This is possible because our online classes are operated in an asynchronous mode, thus the tenure-track faculty member designs and records the course content, while the doctoral student is responsible for answering questions during the time the course is 'run.' This is significant in four ways. First, it leverages faculty expertise as the instructor of record, which is important for rankings and second, from a time perspective, two classes administered in this manner can count as one for the purposes of faculty load (or overload). Third, the students continue to receive cutting edge content and in general are happy with the course and its structure. Fourth, the doctoral student obtains an online teaching experience, which is essential for our doctoral students seeking employment at top-ranked research institutions.

7. Projected Changes

Additional faculty resources would enable us to have more of our tenure track faculty teaching across the graduate programs, either in a full model or in a modified model as described above. For the online programs, this is an important element in the rankings. For the in-person programs, it is valuable to help develop relationships between the students and the programs. It can also be valuable in terms of increasing the number of students who come for a master's degree and decide to continue for a PhD. Additional faculty would also allow us to reduce the use of overload for online teaching and develop new courses that are

connected to research and thus offer more leading edge content. Finally, an additional senior person would enable more proactive succession planning. We are currently recruiting for one junior and one senior tenure-track faculty member.

Additional financial resources would enable us to fund more faculty summer research and provide additional research support to the faculty to pay participants or acquire data sets, thus increasing our faculty retention rates and productivity. This can be achieved through an equitable revenue distribution model that rewards all credit hours and majors equally. The internal model is currently being developed and we expect that, to the extent there are revenues to distribute, MIS will receive its fair share.

Additional funding for our master's programs would help to further increase the quality of the students. We are seeking outside funding to provide greater support for our master's students. Since the last APR, we have two new scholarships that are specifically for graduate students. We also have two new scholarships for PhD students. The department intends to pursue renewal of the SFS program through NSF and we continue to seek funding from our industry partners and individual donors specifically for cybersecurity to continue and grow our SFI program.

Additional staff support would provide much needed relief to our staff, and as one staff member shared, would enable people to "take a real vacation." The challenge for the staff is that if one person is out, the remainder of the staff take on the load. Additional staff would also provide the flexibility to truly work on streamlining processes, as opposed to always running to catch up. One person each for operations and career services would greatly improve work quality and morale.

Change to the Eller online graduate program calendar would extend our reach on campus and enable us to be more efficient in course offerings. The current online calendar in Eller is a bit of a challenge for us, as we attempt to partner with other units on campus (e.g., our online Cybersecurity Program). All of the online graduate programs in Eller operate on an eight-week calendar. Except for one other unit on campus, all other online programs operated on the main campus calendar (i.e., 7 to 7.5 weeks). The challenges of the calendar include inability to simultaneously offer online courses and iCourses, which would enable us to more efficiently offer courses by allowing online and main campus students to enroll in the same section. It also limits our ability to offer courses to non-Eller students and it increases the complexity of our cybersecurity program as we have to navigate two course calendars and ensure adherence to federal laws associated with doing so. The college faculty and leadership are currently assessing the viability of adopting a new academic calendar for our online programs. This will be essential for us to truly increase the efficiency of our course offerings and serve the most students possible.

Funding for the various centers, through grants or philanthropic donations, will enable the department to continue pursuing practically important research projects and educating the next generation of technology-oriented scholars, whether they be focused on issues around data, cybersecurity, AI, or healthcare. We are working with the Eller development team to craft messages around our funding initiatives.

H. UNDERGRADUATE STUDENTS, DEGREE PROGRAMS AND OUTCOMES

1. Undergraduate Degree Programs

The MIS Department offers two undergraduate majors as part of the Bachelor of Science in Business Administration (BSBA) degree in the Eller College of Management: Management Information Systems (MIS; CIP 52.1201) and Operations and Supply Chain Management (OSCM; CIP 52.0205) majors. Our majors are designed for students interested in establishing a career path in management information systems and operations and supply chain management, with a focus on understanding technologies and their application in solving business problems.

The programs are guided by theories of information development and use technical concepts, a grounding that permits students to freely explore various technologies and methodologies. Because the field of MIS encompasses several broad areas (acquisition, deployment and management of information technology, development and evolution of technology infrastructures, and systems for use in organizations), it is widely recognized for its current and future career potential. OSCM topics include process analysis and improvement, quality control, production planning, inventory systems, managing manufacturing, supply chain management, and managing the delivery of services. The OSCM designation began in Summer 2020 with a renaming from the Operations Management (OM) major to OSCM to recognize the growing role that supply chain management plays in the field. Existing OM courses were also recoded to OSCM as they were previously designated under the MIS prefix. Course projects for both majors are employed to help students build writing, teamwork, and presentation skills, and to interact with innovative ideas and technologies that support the development of career potential.

In the past 5 years, the nature of jobs has changed and the type of market for undergraduate students in the United States has seen rapid expansion in large companies such as Amazon, General Motors, Insight Enterprises, Raytheon, prominent consulting firms (e.g., Accenture, Cognizant, Deloitte, Ernst & Young, Protiviti), as well as smaller entrepreneurial firms that develop market-focused software. Organizations that are predominant users of technology are looking for MIS and OSCM students to be more business savvy and have awareness in areas such as management systems process, information assurance, technical and non-technical consulting, and health information systems. For these reasons, the curriculum uses a balanced approach of application and systems development with an awareness of emerging technologies.

The undergraduate curriculum committee, chaired by a full-time faculty member, coordinates the undergraduate programs. The committee oversees curricular and student issues and explores possibilities for course redesign and integration of technologies. A member of the committee represents the department in the college-wide undergraduate committee to guarantee the interests of the department are consistently represented.

2. Contributions to Foundation and General Education Courses

General Education Courses

Patti Ota (Associate Professor) and Brandon Marshall (Lecturer) offer two general education courses: Decision Making and Problem Solving for Daily Life (MIS 150A), and Interpersonal Relationships in a Changing World (MIS 150B). These courses were originally offered as university-wide courses but transitioned to the MIS Department about a decade ago after Patti Ota left her position at the President's office to join the MIS faculty. Both courses are offered in small sections and emphasize critical thinking skills and the application of these skills in making good decision and in personal communications and

relationships – especially in interactions with people of the opposite gender and of different races, cultures, and religions. Both courses are listed as *Gen Ed: Tier 1 Individuals & Societies*. MIS 150B is also listed as *Gen Ed: Diversity Emphasis*. Quality of teaching is assessed using Office of Instructional Assessment student course surveys. Both courses are standalone and are not coordinated with other general education courses.

The purpose of Decision Making and Problem Solving for Daily Life is to investigate the factors affecting daily life such as: how to be better prepared to tackle academic and non-academic problems, how to identify creative solutions, and how to make higher quality decisions. This course helps students put their analytical, creative, and practical thinking skills together to identify and analyze a situation, generate possibilities, choose one, follow through on it, and evaluate its success. About 50 students enroll in this class each year (including winter and summer terms).

The purpose of Interpersonal Relationships in a Changing World is to understand how the communication process operates – verbally and non-verbally, individually and in groups, and how communication affects personal and cultural concepts of who we are. This course includes understanding of stigma and prejudice, and how they relate to racial bias, gender differences, sexual orientation, variance of abilities, and cultural identities. This course tries to explore all sides of every issue and encourages students to think critically, to have a willingness to take risks, and a tolerance towards ambiguity and viewpoints different from their own. About 75 students enroll in this class each year (including the summer terms). MIS 150B is currently in the process of being re-certified under the new general education guidelines.

Learning Outcomes for MIS 150A and MIS 150B include:

- Outcome 1 (MIS 150A only): Understand preferred learning style(s) and how to apply them to decision-making and problem-solving.
- Outcome 1 (MIS 150B only): Understand preferred communication and learning style(s) and how to apply them to decision-making and problem-solving.
- Outcome 2: Understand how to utilize strengths and improve weaknesses to make good decisions.
- Outcome 3: Understand how to deal with specific nonacademic problematic decisions.

3. Undergraduate Programs' Enrollment and Curriculum

Undergraduate enrollment trends for the MIS and OSCM degrees are detailed in Table H1. The data provided by the Academic Program Review Dashboard show the number of upper-division students (undergraduate juniors or seniors that have advanced from pre-business designation) enrolled in the MIS and OSCM undergraduate programs for the years 2015 – 2021.

Table H1: MIS and OSCM undergraduate enrollment 2015-2021

2015	2016	2017	2018	2019	2020	2021
MIS						
279	280	332	356	338	362	373
OSCM						
10	40	54	54	58	62	66

Table H1 details significantly increasing enrollments in the MIS major. The previous APR reported an average enrollment of 185 MIS students (current average is 331), representing an average increase of 79% since the last APR. The OSCM major has remained more consistent since the last APR, with a previous

average enrollment of 54 students (current average is 49). Enrollment in the OSCM major dipped in 2015 but recovered by 2017 and is now growing steadily each year.

While the department has consistently worked hard to achieve higher enrollments and welcomes this healthy trend, the immediate impact on the department resources is that two sections of each required MIS course are offered every semester. Although we are currently able to meet demand for required courses, recent growth trends in both first and second major enrollments have required us to offer three sections of certain courses on occasion.

Enrollment in the OSCM major has been low in comparison to MIS. This is not surprising given the lack of course offerings and faculty in the area. Until recently, we had only one professor, one lecturer, and one adjunct able to teach courses in the operations area. Following the retirement of the professor and the adjunct, we have supplemented our OSCM faculty by recruiting a new assistant professor and a lecturer with an entire career of industry experience. Many of our OSCM majors are MIS/OSCM double majors, so the number of stated MIS and OSCM majors double counts these students, as we do not track double majors independently. For the student, the marginal "cost" of being a double major is relatively low, only 2-3 extra courses, leading many students to elect this option. Maintaining a large number of MIS/OSCM double majors is advantageous for the department, as the additional enrollment allows us to continue offering sufficient courses so that students can choose the option to select the OSCM degree as their only major.

Eller College Undergraduate Program

As introduced in Section 1, the undergraduate programs offered by the MIS Department are majors within the Bachelor of Science of Business Administration in the Eller College of Management. Our college has historically maintained strict admissions requirements. All business majors must have a minimum 2.75 GPA and combined 3.0 admission score (foundation Eller GPA, overall cumulative GPA, and professional admissions assessment) to be admitted as business majors to the Eller College of Management at the beginning of their junior year. As a pre-business student, MIS and OSCM majors also take Computing and the Internetworked Society (MIS 111).

Business and general education requirements ensure MIS and OSCM students, like all other business students, are exposed to general business background and a certain degree of liberal arts education.

All business students are required to take the following in addition to their major courses:

- General Education distributed across five areas: Foundations (Composition, Mathematics, Second Language), Introduction to General Education, Exploring Perspectives, Building Connections, and General Education Capstone.

- Professional Core. Thirty upper-division units (300 or 400 level) in the following courses: Marketing, Finance, Accounting, Management, Communications, Micro and Macro Economics, Information Systems, Operations Management, Ethics, Business Law, Entrepreneurship, and several elective areas.

Courses Taken by MIS and OSCM Majors

The undergraduate curriculum prepares students for professional careers through balancing instruction in theory with courses in technical application and organization/behavioral knowledge. Rapid advances in technology, intense international competition, faster production life cycles, and more complex and specialized markets demand that students must receive training that will prepare them to analyze organizations, technology, and user requirements rapidly and thoroughly. Graduates who combine analytical

and communication skills with technical knowledge, business knowledge, and interpersonal skills are in high demand. Our courses seek to develop and foster these competencies.

As a department within the Eller College of Management, our curriculum standards are governed by the guidelines set by the American Assembly of Collegiate Schools of Business (AACSB). AACSB's accreditation promotes continuous quality improvement in collegiate schools of business. Standards for business administration were first set in 1919. In 1980, AACSB set additional standards for bachelor and master's programs in accountancy to address special needs of the profession. In April 1991, AACSB members overwhelmingly adopted new "mission-linked" accreditation standards and procedures that support institutions offering degrees in business administration and accounting. The AACSB does not identify a specific curriculum for Management Information Systems or Operations and Supply Chain Management.

Within the IS academic discipline, curriculum guidelines are set by a joint committee formed by the Association for Computing Machinery and the Association for Information Systems and the Association of Information Technology Professionals. This joint committee produced *IS'2002 Model Curriculum and Guidelines for Undergraduate Degree Programs in Information Systems*, a report recommending that the curriculum be divided into three modules: general courses in information systems, specialized information technology and specialized application development, deployment, and project management**.** The guidelines were updated in 2010 (*IS 2010*) and again in 2020 (*IS 2020)* and include a re-focusing on six IS competency realms in the areas of IS foundations, and data, technology, development, organizational and integration competencies. The core content of the 2010 report did not change but was enhanced with a new focus on competencies. All business students are required to take MIS 111 and 112, which introduce them to IS foundations and offers important training in personal productivity tools, particularly Excel, which will be used throughout their business school education. Given our current environment, our curriculum is very closely aligned with the guidelines. We have also recently benchmarked our curriculum in comparison with peer schools and have found our offerings consistent with other leaders in the field. Our MIS undergraduate program requirements are shown in Table H2. Four core classes are required and two electives may be chosen from a list of possibilities.

Table H2: Undergraduate MIS curriculum

(4) Core Classes	(2) Elective Classes
Database Management Systems	Project Management
Data Structures and Algorithms	Social and Ethical Issues of the Internet
Information Systems Analysis and Design	Information Security Risk Management
Business Data Communications	Systems Security Management
	Information Security in Public and Private Sectors
	Detection of Deception and Intent
	Data Analytics
	Introduction to Enterprise Computing
	Supply Chain and Logistics
	Optimization and Decision Support Modeling
	Production and Operations Management I and II

With the growth of our OSCM program, we have sought to update and improve our curriculum to ensure competitiveness in the field. Supply chain continues to be a growing area of importance, and we are currently in the process of updating our curriculum to reflect that. The existing curriculum requires two core courses and three electives. A concern with our current requirements is supply chain is an elective course. Accordingly, a task force of OSCM faculty and our department head have put forth a proposal to enhance

the OSCM curriculum by moving Supply Chain and Logistics into the core and adding an additional required elective. Doing so would bring the OSCM requirements in line with our MIS major by requiring six total courses instead of five. Our current OSCM undergraduate program requirements are shown in Table H3.

Table H3: Undergraduate OSCM curriculum

(2) Core Classes	(3) Elective Classes
Production and Operations Management I	Supply Chain and Logistics
Production and Operations Management II	Optimization and Decision Support Modeling
	Data Analytics
	Project Management
	Introduction to Enterprise Computing
	Managing for Quality Improvement

We rely on our individual faculty members to stay abreast of trends in their area of expertise. As our field is highly dynamic, we change course content and pedagogical approaches frequently. Faculty members' research programs and professional insights are supplemented by interactions with industry advisors and recruiters. As a result of increased interest in issues associated with enterprise computing, privacy, data analytics, and optimization, we have piloted the following new elective courses:

MIS 411: Social and Ethical Issues of the Internet
MIS 427: Introduction to Enterprise Computing Environments
MIS 464: Data Analytics
OSCM 471: Optimization and Decision Support Modeling for Business

These elective courses have been popular among the undergraduate students and we intend to continue offering them.

Courses taught by our faculty extensively leverage instructional technology such as D2L, audience interaction through response technologies (although admittedly hindered by COVID), and other engaging techniques. Our MIS and OSCM majors are currently offered in the traditional ground campus only as we are waiting for sufficient online student demand from the college at the undergrad level to offer the major.

Courses Taken by all Eller College of Management Majors

Our introductory course, MIS 111: Computers and the Internetworked Society, is co-taught by Bill Neumann (Professor of Practice) and Mark Patton (Senior Lecturer). The course is taken by approximately 2,900 pre-business undergraduate students and non-business majors each year (300 of the total number of students are members of the Arizona Online campus).

This course serves the College and the University through providing an understanding of the knowledge and skills required by not only information systems but also all business professionals for students in the Eller College and for many majors across campus. MIS 111 explores how information systems contribute to all professions and academic disciplines. Themes for the course focus on globalization, sustainability and the environment, the law, medicine, social ethics, art, music, and other aspects of society. Students also gain hands-on experience with information technology tools that will help them in their college career.

MIS 111 is a large lecture class. To make the course more interactive, audience response techniques are utilized to engage the students as active learners. During each MIS 111 class, students use color-coded cards to respond to conceptual questions and generate classroom discussion. In class evaluations, students have indicated that this technique makes the classroom experience more engaging as well as allowing them to

assess their understanding of the material. The use of the interactive techniques allows the instructor to tailor the lecture dynamically based on the responses from the students. If a concept is well understood (i.e., mostly correct answers), the instructor can continue with the lecture. However, if the class did not grasp a concept (i.e., a significant number of students answered incorrectly), the instructor can review key concepts of the material, perhaps use a "think-pair-share" engagement to facilitate peer discussion, and then "re-poll" the class. Since participation credit is awarded for these activities, students are highly motivated to be prepared for class and engage in the assessment activities.

The MIS Department offers MIS 112, a one-credit Microsoft Excel lab, in conjunction with MIS 111. MIS 112 is taught by Bill Neuman and managed by Paulo Sudhaus (Academic Coordinator). The lab component is part of the redesigned set of Math requirements for all the business majors. It is not delivered as just a primer in the mechanics of Excel, but rather it has been designed by MIS faculty to be a business analytics complement to MIS 111. Students learn the Excel skills and apply them to realistic business datasets and case studies. The content of this lab is a pre-requisite for the other math and stats courses business students take. The course has been successful and has created opportunities for upstream courses to increase their deployment of business analytics skillsets.

The department also offers two upper-division service courses that are required for all Eller College undergraduate business majors: Using and Managing Information Systems (MIS 304) and Basic Operations Management (OSCM 373). Students enrolled in MIS 304 compete in a live and in-person case competition to ensure that our students learn how to communicate with a managerial audience about technical topics. The competition leverages external judges as part of the Eller experience. Approximately 900-1000 business majors take each of these courses each year.

The MIS Department has also responded to both the expansion of the University's online campus and the growth of the Eller College of Management global programs by offering courses such as MIS 111/112, MIS 304, MIS 478 (Project Management), and OSCM 373 on multiple platforms (e.g., Arizona Online, global micro-campus). MIS 111 also serves the Business minor, the largest minor on campus. In addition to meeting the needs of students who are not in residence, the flexibility of these classes will assist us in staffing theses classes during our summer and winter sessions.

4. Undergraduate Students

As discussed in Section 3, students applying to the MIS and OSCM programs must adhere to the Eller College's admission guidelines of having a combined 3.0 admission score (foundation Eller GPA, overall cumulative GPA, and professional admissions assessment). Compared with main campus, over the last five years our students had on average a higher degree GPA (3.45 for the MIS department vs. 3.28 for main campus).

Undergraduate completion trends and average GPAs by major for the MIS and OSCM degrees are detailed in Table H4. The data provided by the Academic Program Review Dashboard show the number of upper-division students (undergraduate juniors or seniors that have advanced from pre-business designation) that completed the MIS and OSCM undergraduate programs for the years 2015 – 2022.

Table H4: MIS and OSCM undergraduate completions and average GPA, 2015-2022

	2015	2016	2017	2018	2019	2020	2021	2022
	MIS							
Completions	149	159	150	169	225	172	219	206
Average GPA	3.35	3.38	3.42	3.43	3.41	3.52	3.35	3.60
	OSCM							
Completions	23	21	28	40	38	41	51	41
Average GPA	3.39	3.29	3.37	3.40	3.54	3.58	3.43	3.57

Completions have increased over time for both majors with 2022 completions 38% higher for MIS and 78% higher for OSCM when compared to their respective 2015 completions. Further, average GPAs have generally increased for both majors over time.

As shown in Figure H1, the number of both male and female students enrolled in undergraduate majors offered by the MIS Department has increased over the period from 2014-2021.

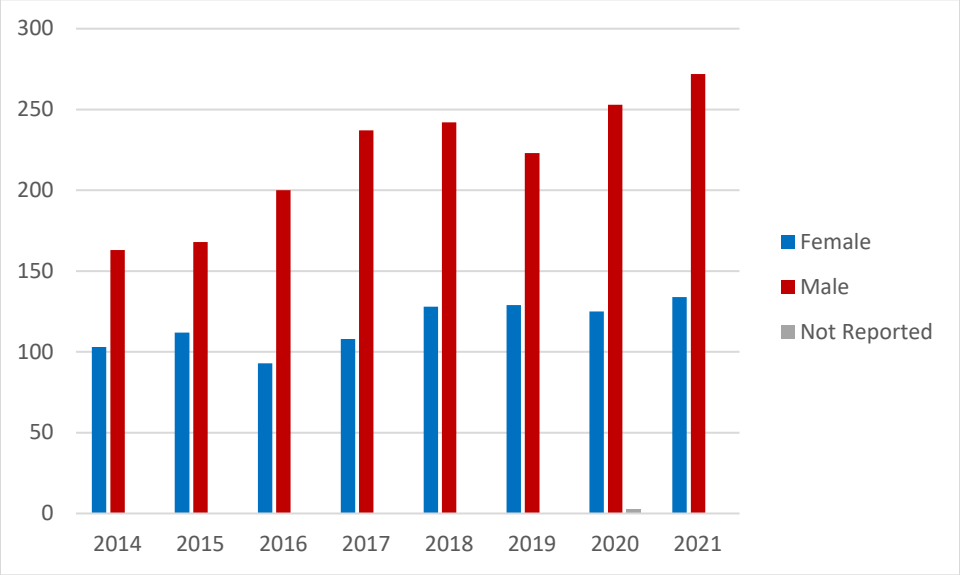


Figure H1. Number of males and females enrolled, 2014-2021

Our race/ethnicity composition primarily includes students of white, Asian, Hispanic or Latinx, and international descent during the period from 2014-2021 as shown in Figure H2. The race/ethnic diversity of the MIS Department is similar to (or possibly more diverse than) the University overall (in 2021, approximately 45% of the students enrolled at the University of Arizona were from the following minority groups: Black or African American, Asian, Hispanic or Latinx, and American Indian or Alaska Native). Although there is some double counting of students due to inclusive race/ethnicity reported, approximately 50% of our students identify as white whereas the University reports over 65%.

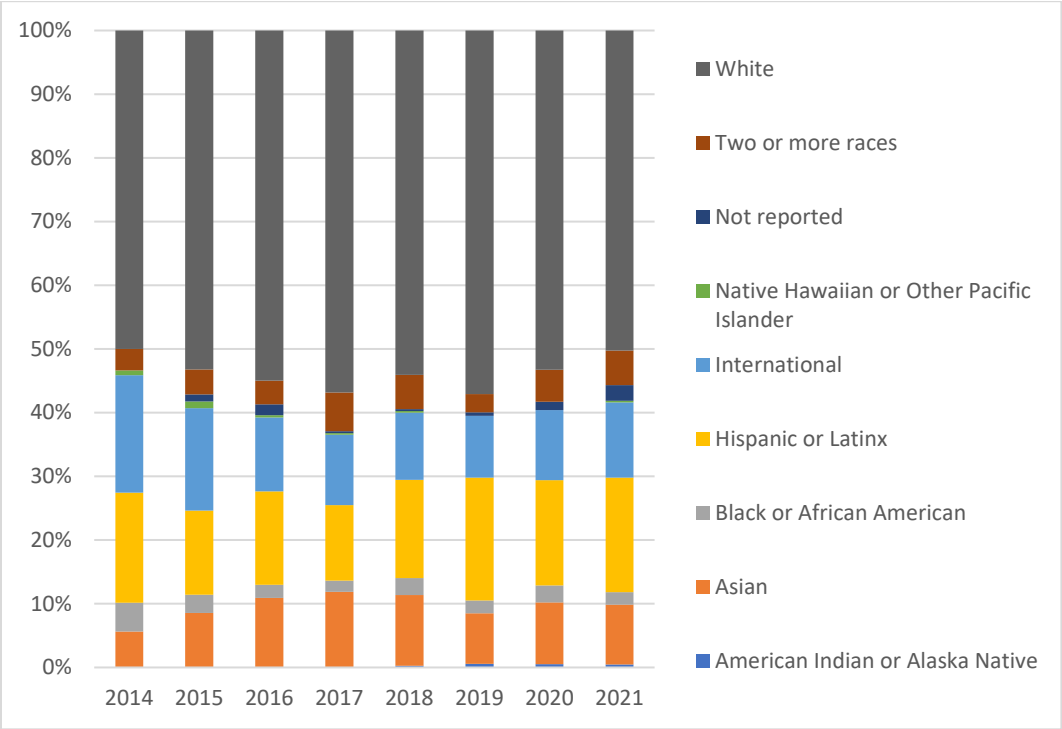


Figure H2. Race/Ethnicity composition of students, 2014-2021

A recent initiative established in 2020 by the MIS Department to increase recruitment of students from under-represented groups is the Chen-Chow Bear Down Scholarship. The goal of the award is to engage students from Native Nations in the Eller College and MIS. Students of Native American descent, as well as students who have a demonstrated interest in the Hispanic and African American cultures, are encouraged to apply, regardless of their current GPA. The Scholarship is part of the Bear Down Scholars Program that provides opportunities for scholarship recipients to engage in activities designed to help them be successful at Eller and to increase their understanding of MIS.

Efforts to attract and retain Honors students

Although the MIS Department does not currently offer honors sections of specific courses, the department does engage in honors contracts and theses with students. As displayed by Table H5, honors student enrollment in the MIS Department has increased by 91% since 2014. The current faculty size precludes the offering of honors sections. With additional faculty, we would like to offer honors sections, particularly for MIS 111, which serves over 2000 undergraduate students per year.

Table H5: MIS and OSCM honors students 2015-2021

2014	2015	2016	2017	2018	2019	2020	2021
44	58	61	64	95	80	76	84

Recruiting MIS and OSCM Majors

While the MIS pre-business core allows MIS to be the first contact with Eller pre-business students, it also limits our access to the students during the critical time when they are selecting their major. In recent years, the following strategy to improve student awareness of the MIS program has been implemented, focused primarily on pre-business students:

- Using in-class presentations in MIS 111 to highlight career opportunities in MIS,
- Offering top students in MIS 111 the opportunity to serve as preceptors,
- Offering students in MIS 111 who are interested in MIS/OSCM the opportunity to participate in the Zipperman Scholars Program (discussed below),
- Expanded department-level career planning and academic advising,
- Grace Hopper Celebration (women in computing) conference scholarships,
- CoMIS Case Competition team funding, and
- Expanding the scholarship funding for MIS/OSCM students (discussed below)

Zipperman Scholars Program: Sponsored by a member of the Eller National Board of Advisors and led by a full-time faculty member, the Zipperman Scholars Program provides pre-business students a unique opportunity to engage with MIS students, faculty, and professionals. Students are typically recruited at the end of their first semester at the University as they complete MIS 111. The top students in the class receive a personalized invitation from the department inviting them to apply for the program. Students are asked to complete a short essay describing their interest in MIS, as well as their future academic plans. The applications are reviewed by a panel of faculty members, who select each semester's class.

As a Zipperman Scholar, students are actively engaged in a variety of activities to increase their awareness of the MIS Department's academic programs and professional opportunities. During each semester, students receive a small scholarship and are invited to social and professional development events. Students are expected to participate in a number of events, such as mock interviews, resume reviews, guest speakers, and field trips to see information systems and operations management in the business world. In recent semesters, field trips have included attending Phoenix Suns basketball and Arizona Cardinals football games followed by "back-stage" tours of the stadiums as well as a tour of a Walmart distribution center to learn more about the MIS / OSCM aspects of the organizations visited.

Advanced Zipperman Associates (AZA) Program: Sponsored by a member of the MIS Board of Advisors and led by a tenured faculty member, the AZA program planning began in 2018, but officially launched in 2019. It has a cohort of 40 students with a goal to expand to 50 students. The AZA program builds on the Zipperman Scholars Program by offering an advanced two-year track focused on professional preparation for careers in tech consulting. Students in the program work with a professional mentor, receive internship placement support and networking opportunities, and receive a yearly $1,000 scholarship.

Chen-Chow Bear Down Scholars Program: Funded by a generous gift from Drs. Hsinchun Chen and Sherry Chow, is designed to stimulate interest and create excitement about business in general and the MIS program more specifically among Native American Eller students. The program was launched in spring of 2021 and offers a renewable scholarship, as well as opportunities for scholarship recipients to engage in activities designed to help them be successful at Eller and to increase their understanding of what MIS is and what a job in MIS might look like.

Joelle Benson STEM Award: Funded by an endowment established by MIS Board of Advisors member Joelle Benson, the program provides annual funding for 2 to 3 undergraduate students to participate in the Grace Hopper Celebration of Women in Computing.

CoMIS Case Competition: Each Spring a faculty advisor from the MIS Department trains a team of four students (three competitors and one alternate) to compete in an international case competition. The team travels to the University of Minnesota each year where they compete over four days. In recent years our team has placed as high as 2nd and 3rd against top universities from around the world. The costs for attending the competition are funded internally by the MIS Department.

MIS/OSCM Academic Scholarships
In recent years, the following academic scholarships targeted for MIS/OSCM majors have been created (along with selection criteria):

- Stoner Family Endowed Scholarship – Arizona resident, academic achievement, full-tuition
- Joseph and Mary Cacioppo Scholarship – Financial need
- Konana Family Endowed Scholarship – Financial need
- Konur Family Scholarship – Merit and financial need
- LaSalle-Chen Scholarship – Non-traditional and under-represented students
- William & Florence Schmidt Endowed Scholarship – Open to all MIS/OSCM majors
- Ellerman Awards for Leadership and Academic Excellence – Open to all MIS/OSCM majors

Through the generous support of these benefactors, the awards not only recognize the accomplishments of and help financially support our students, but also enhance the reputation and appeal of the MIS/OSCM majors within the pre-business student community.

MIS Undergraduate Advising
The Eller College's Undergraduate Program maintains a full-time undergraduate advisor for MIS and OSCM majors. In addition, the MIS Department has a full-time career advisor and the MIS undergraduate programs director (a full-time faculty member) regularly meets with students in a variety of venues to offer advice and guidance. Along with these dedicated resources, all members of the faculty routinely meet with students to discuss careers and other areas of student interest during regular office hours and ad hoc appointments.

Undergraduate Professional Development and Advancement Initiatives
Well-qualified students who are interested in pursuing a master's degree in MIS can enroll in the Accelerated Master's Program (AMP). In partnership with the Graduate College, the AMP program offers students a number of advantages over the traditional path to a graduate program. First, students are allowed to take one or more 500-level graduate classes as undergraduate electives. AMP students not only receive the benefits of advanced graduate study, but also are allowed to include their AMP classes on both their undergraduate and master's programs of study, accelerating their time to completion of their graduate degree.

Extra-Curricular Learning Opportunities
Currently, students have internship opportunities at local, state, and national levels. Increased interactions with an industry advisory board will promote greater opportunities for internships and permanent placement. Students at the undergraduate level gain professional and work experience within the department, its research centers and groups, and laboratories through part-time jobs. Undergraduate students also can participate in an active student association which has a full-time faculty member as an advisor.

The MIS Department has a board of advisors that supports the development of partnerships to influence student mentoring, internships, and placement. In conjunction with executive support, scholarships and internships are being developed to help students build business experience while in school. Elective course offerings, some in partnership with industry involvement and support (e.g., ERP, Information security, and Web services) will allow a breadth of exposure to students.

If market is an indicator of the quality of the students we produce, the improvement in the market condition, as reflected in the salary data below, is a reflection that we are satisfying the needs of the market with a high-quality product. Average salaries for undergraduate majors are shown in Table H6.

Table H6: Average starting salaries for MIS and OSCM majors

2016	2017	2018	2019	2020	2021	2022
$53,202	$59,808	$61,409	$61,430	$61,330	$65,190	$71,320

Selected recent placement information is shown in Table H7.

Table H7: Recent undergraduate placement information

Company	Title
Deloitte	Cybersecurity Analyst; IT Analyst; Risk and Financial Advisory Consultant
Insight Enterprises	Associate Consultant
General Motors	Software Developer; Software Test Engineer
Amazon	Area Manager; Solutions Architect
Ernst & Young	Associate Analyst; Information Risk Consultant; Cybersecurity Consultant
Protiviti	Technology Consultant; Internal Audit and Financial Advisory Consultant
KPMG	Advisory Associate; Technology Assurance Associate
Raytheon	Software Engineer; Digital Technology Leadership Development Program
Microsoft	Software Engineer

Undergraduate Student Organization

Management Information Systems Association (MISA):

MISA serves as a networking link for undergraduate MIS majors at The University of Arizona by providing support for academic as well as professional pursuits. The membership composition of MISA is quite diverse, ranging from freshmen to graduate students to alumni. This diversity provides a valuable source of assistance, external contacts, and a broad base for new ideas.

Meetings are informative and beneficial. Speakers from a variety of industries are invited to introduce students to the opportunities and challenges confronting them upon graduation. Traditionally, meetings are typically informal however, when prospective employers address the membership, students are encouraged to dress in business attire and have a copy of their resume. In the past, MISA meetings have been an excellent forum for identifying internships and employment opportunities.

5. Undergraduate Program Learning Outcomes Assessment

Taskstream URL:
https://www.taskstream.com/ts/bsbamanagementinformationsystemsoperationsman/ProgramAssessment

Taskstream password:
misdept

Since the last APR, our department has refined our approach to assessing student learning outcomes by including a challenging yet achievable ideal target score. Previously our ideal targets were unrealistic in expecting that 100% of students will achieve a particular outcome. While that approach was aspirational it creates negative incentives in how students are assessed. Even still, existing measures used to assess the SLOs have shown that our department has met our goals sufficiently.

However, in previous years, we relied largely on direct measures to assess learning outcomes. Starting in 2020, we introduced a student survey to assess indirect program-level measurement. The survey has given

us some data to study and reflect upon. While the results from the survey were satisfactory overall, we did observe that some of the student responses indicated a level of stress due to COVID-19. As courses and employment opportunities have started to return to pre-pandemic normalcy, we feel that future surveys will more accurately capture student assessments of the program.

Looking ahead as we attempt to identify achievement gaps with regard to student demographics, we plan to utilize the findings from our student survey to inform measures used to assess SLOs. In addition, the undergraduate committee will continue to review student learning outcomes each year to examine their currency and usefulness, especially as regards achievement gaps. We hope that our approach will ensure that the curriculum stays current with the changing needs of the field of Information Systems and that our program stays current with the changing needs of our students.

I. GRADUATE STUDENTS, DEGREE PROGRAM(S) AND OUTCOMES

A. Overview

Programs Offered
The MIS Department offers three graduate in-person degree programs: an MS in MIS (CIP: 11.0103), an MS in Business Analytics (CIP: 52.1399), and a PhD in Management with a major in MIS. The department also participates in several online, specialty degree and certificate programs. Our two online programs are an MS in MIS (CIP: 11.0103) and an MS in Cybersecurity (CIP: 43.04.03). The MIS master's degree program participates in dual degree programs with other graduate programs including the Eller MBA program, MSBA, Cybersecurity, and Accounting. We also have a Technology Leadership Program (TLP) for exceptionally qualified candidates in our main campus program. In addition, we offer two graduate three-course certificates in Enterprise Security (CIP: 11.1003) and Business Intelligence and Analytics (CIP: 52.1201).

Meeting Student Needs and Interests
The variety in our programs and certificates have been designed to meet student needs and interests. We also offer multiple concentrations for our MS MIS students (using core and elective courses), including Security and Information Assurance, Business Intelligence and Analytics, and Managing Business Operations. We are also working to develop a Product Management concentration.

Our MS and PhD programs require a core curriculum that features technical and managerial components. These courses stress the development of analytical and critical thinking skills. The doctoral program also requires a core set of research methodology and statistics classes. Elective courses supplement the core courses and provide specialization. These courses reflect the faculty's research strengths in the areas of data analytics, cybersecurity, artificial intelligence, database development, systems analysis/design, information assurance, deception detection, and decision support.

Professional Master's
Most students are enrolled in our professional master's program, and, therefore, complete an applied experiential learning consulting project rather than a traditional thesis. However, we offer students who are interested in a research-oriented master's degree the option of completing an individual research project as part of their degree requirements. In recent years, students have largely opted for the consulting project route.

Program Oversight
Our MIS master's program committee oversees the master's program, while the doctoral committee oversees the PhD program. Members of the committees are appointed by the department head for one-year terms.

The master's program committee is comprised of three or more voting members: a chair and at least two other faculty members. The committee functions include reviewing and revising curriculum, defining and reviewing learning outcomes, and assessment and managing scholarship. Committee recommendations are presented to the faculty by the committee chair and require faculty ratification. A member of this committee sits on the College Graduate and Professional Studies committee.

The doctoral program committee is comprised of three or more voting members: a chair and at least two other faculty members. The committee functions include reviewing PhD applications, reviewing student progress in research and teaching, and reviewing and revising curriculum. The doctoral program committee reviews student annual reports and provides written feedback. The chair of the committee is responsible for

coordinating the administration of the first-year core exam. All faculty involved in writing exam questions are invited to participate in the grading process (questions are graded independently by two faculty members). The committee recommendations are presented to the faculty by the committee chair and require faculty ratification. A member of this committee sits on the College Research and Doctoral Studies committee.

Responsibilities for assignment of instructors and selection of offerings are shared by the MIS graduate programs committees, the MS and PhD directors, and the department head. In general, oversight of the instructional material for individual courses is the responsibility of the faculty member assigned to the course.

Syllabi Requirements
The appropriate department committee ensures that co-convened courses (400/500 level) have appropriately advanced and differentiated learning outcomes for graduate students, and these expectations are made clear to students. We currently have eight co-convened courses, largely in the Operations and Supply Chain area, for which there is insufficient demand for the courses in either the undergraduate or the graduate program alone.

Learning Outcomes for Different Modalities
The department has also ensured that the key learning outcomes for the same course offered in-person, hybrid or online are the same. While there will always be some modifications required in each course in order to provide the best learning experience for each course-offering modality, these aspects do not materially alter the learning outcomes defined for the course itself.

Student Organization
The Management Information Systems Graduate Association (MISGA) is a student organization at the University of Arizona with a mission to generate interest in the fields of MIS and business analytics by addressing professional, academic, and social needs in the graduate community.

During the calendar year, MISGA sponsors many activities to meet student needs. Most of these activities fall under the following categories:

- Guest speakers, including representatives from local firms and alumni
- Informal workshops on current topics of interest, such as data mining and search strategies
- Hosting and sponsoring participation in case competitions
- Specialized services, including our Buddy Program which annually pairs new students with those currently in the MS MIS program.

Although MS MIS students form the foundation of MISGA's membership, any interested students, including MSBA students and those involved in the undergraduate student association, MISA, are invited to participate in the sponsored activities and administrative functions. Students in both the MS MIS and MSBA programs have served as officers in MISGA.

MISGA does not collect dues or process memberships via applications. Instead, the organization is funded through a revenue sharing agreement in which the student organization receives one-half of the seat fees paid by incoming students. The only requirement for membership is participation. Upcoming activities are announced online to graduate Eller students via email and by flyers posted throughout McClelland Hall.

B. MS MIS and MSBA Programs

The MS MIS program requires 30 credits and the MSBA program requires 33 credits. Both programs include a consulting project with a live client. In addition, most MS MIS students complete a class in professional business communications. While there continues to be demand for personnel well versed in advanced technologies such as data analytics, cybersecurity, product management, and supply chain management, there is growing demand for those who can integrate these technologies with existing and cloud IT architectures, as well as those who can strategically position these technologies for business value.

Strategically, our goal is to continue to revise our graduate program to reflect and anticipate the changing realities and requirements of the professional needs of each respective graduate program. While our MS programs are designed primarily for full-time in-residence students, our program offers the necessary flexibility to support the needs of part-time and dual-degree students. However, since most of our graduate classes are offered during the day, working professionals would need to obtain release time to attend class.

In response to student and employer needs, we have put in place activities to help students transition into the MS MIS and MSBA programs. During the summer before they start classes, we actively engage students in an attempt to help them address skill deficiencies (e.g., in Python or SQL), work on their résumés, and begin the process of planning for their future careers. This helps students acquire the knowledge they will need during and after the program.

Students who take our on-campus programs (e.g., MS MIS and MSBA) arrive early to complete an orientation that includes modules on tailoring résumés and cover letters, academic writing, job-search and networking, career search strategies, building their brand, etc. These students also have an opportunity to complete skill-building bootcamps in Python and SQL to refresh work done over the summer and lay a foundation for the upcoming coursework.

A few years ago, we added a Data Analytics Challenge (DAC) to close out the orientation week activities for the MS MIS and MSBA students. Students (in teams) are given a large dataset and questions to address. Along with providing students an opportunity to practice teamwork and showcase their technical skills and strategic thinking, this helps create an important sense of community and prepare students for their studies in our professional program. Moreover, as the judges for the DAC are a combination of faculty, senior (2nd year) cohort students, and their peers, this also helps students build their professional network. This has been a very popular event to wrap up orientation and launch the programs. It also provides a significant baseline to help students truly see their progress in the program.

MS Student Profile

The student profile in our MS level programs is similar to the graduate MIS programs in our peer institutions, with international students forming a large percentage of our program's enrollment.

MS Ethnic Profile

Figure I1 shows the self-reported ethnicities of students enrolled for fall 2014-2021. The data is aggregated across our MS MIS (on-campus and online) and MSBA degrees.

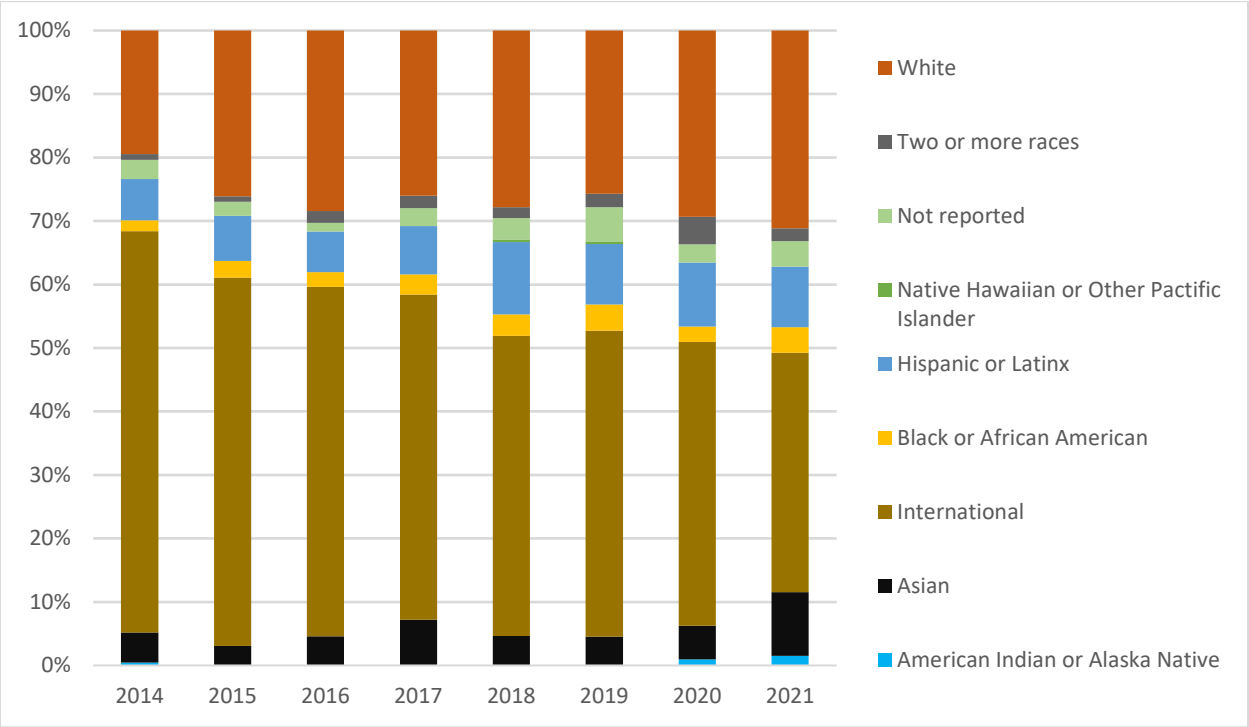


Figure I1: Self-reported ethnicities for the MS MIS 2014-2021

The percent of women in the program has averaged a little over a third over the 2014-2021 (period for which data is available) and is seen in the table that follows. This is representative of the information systems field.

Table I1: Percent of female students enrolled in the MS MIS 2014-2021

Female Enrolled Students		
YEAR	**Number of Female Students**	**Percent Female**
2014	61	26.41%
2015	62	27.43%
2016	71	32.57%
2017	90	36.00%
2018	77	32.49%
2019	102	42.32%
2020	89	42.79%
2021	73	36.68%

MS Curriculum

The outline of our MS curriculum is shown below in Table I2. The core and elective courses are periodically reviewed to make sure they meet the needs of students and what is being demanded in the marketplace today. The curriculum is similar for both the on-campus and online MS MIS programs (the primary difference being that not all electives are currently offered online due to our carousel model that ensures a recommended program of student that offers a more timely path to degree completion).

Table I2: MS MIS curriculum (listed alphabetically)

Core Classes	Elective Classes
Business Data Communications and Networking	Big Data Technologies
	Business Courses (business preparation)
Business Foundations of IT	Business Intelligence
Data Mining for Business Intelligence	Cloud Computing
Eller Business Consulting	Data Visualization
Enterprise Data Management	Deep Learning
Information Systems Analysis and Design	Healthcare Information Systems
	Information Security in the Public and Private Sectors
Strategic Communications	Information Security, Risk Management, Disaster Recovery
	Introduction to Enterprise Computing Environments
	Optimization for Business
	Production and Operations Management
	Project Management
	Social and Ethical Issues of the Internet
	Supply Chain and Logistics
	Systems Security Management

In our current curriculum, most of the credits taken fall into the required or core category. However, students are allowed to select among several elective classes, based upon their professional interests, such as business intelligence, cloud computing, data visualization, information security, or project management. If students can demonstrate that their prior professional or academic experience meets the learning outcomes of a required course, the students are allowed to replace the core class with an elective.

Active Learning strategies

Our department offers professional master's degrees. As a result, many of our courses are applied and include active engagement in the classroom. The instructors, assisted by teaching assistants as appropriate, facilitate the learning and provide students with hands-on opportunities to develop their knowledge and skills. Some of these sessions are conducted in computer labs as needed.

During their second semester, master's degree students are required to complete an applied experiential team-based industry-sponsored project as part of their consulting course. The course helps students apply their classroom knowledge to addressing a real-world problem sponsored by an actual client. Examples of clients that students have worked with in the recent past include Samsung Electronics, Rio Tinto, Intel, Raytheon, Tucson Electric Power, San Diego Gas & Electric, Banner Health, First American, and Watermark. This project is a critical part of the training process in which a student develops their professional skills. During the project, students are mentored on project management principles such as project definition, status reports, and presentations under the coordination of an instructor. Examples of some recent projects include:

- Evaluate video analytic software for client applications,
- Evaluate business processes and technology for controlling access to secure areas,
- Improve response time for emergency room decision support system,
- Evaluate Business Intelligence software for client applications.

We emphasize internships during the summer as an important part of the program. All MS students are strongly encouraged to work on a summer internship. Since the Summer of 2013, over 400 (85.33%) students worked on internships with companies including Amazon, PwC, Walmart, Salesforce, and American Express, along with a number of smaller regional companies. Since students participating in our AMP finish the program in one year and do not participate in a summer internship, these students without professional experience in information systems are strongly encouraged to complete an internship during the summer after their senior year (or spring/summer for December graduates).

Use of Instructional Technologies

As a national leader in MIS programs, we take pride in being a technology-focused program. As a result, we have also been active adopters of a variety of technologies for instructional use. Our courses are offered on D2L (previously on Blackboard, when the college used that platform) where students typically will access content, complete assignments, and take quizzes/tests. Faculty also use several built-in and linked technologies including Zoom, Panopto, Intelligent Agents, Surveys, Awards, etc. Our courses also use a variety of other technologies including YouTube/Vimeo presentations, response devices, interactive media, online proctored exams, and cloud computing (e.g., Amazon Web Services, Microsoft Azure, Google Colab). We were among the first departments to pioneer the use of cloud computing in our courses over a decade ago.

MISOnline Master's Program

In 2013, the department launched an option to complete its master's program fully online. The courses have been adapted by the faculty from the in-person MS MIS program into an 8-week calendar, allowing a more flexible design that still parallels the program requirements of the existing MS program. Not only does this strategy leverage the existing brand, but it also allowed this program to be offered without additional approvals of the Arizona Board of Regents. Currently, core classes offered in the online program are not made available to our full-time students, although some elective classes (e.g., if they are not available on-campus) are made available to students as deemed appropriate by the department.

The online MS program targets a very different audience from the current full-time MS program. In the online program we primarily serve domestic students who are currently working IT professionals. We expect the full-time residential program to continue to attract international students as the majority of its students. These international students benefit from their residential experience in the US to enhance their careers and obtain new employment opportunities.

Although the online program parallels our traditional program academically, there are a number of dimensions of the online program designed to appeal to a non-traditional student. Students in the online program are offered greater flexibility in when classes are taken, and the online program has adapted to serve these students in a number of areas such as structuring courses to reduce the need for pre-requisites. Since courses are not offered in the existing three-semester sequence, our academic advisors work closely with students to ensure timely completion of their degrees. Similarly, the department has adjusted the timing of offerings to allow faculty to offer both the online and face-to-face class offerings.

Our existing full-time program offers students a well-structured progression for developing them as information systems professionals. Beginning with a foundation of advanced course work, students engage in a team-based consulting project with a real-world client, followed by a summer internship, and finally professional career skill building to prepare them for them for recruiting and full-time employment. As we serve our online student community, we have maintained the core learning outcomes in the MS MIS courses, and we have taken advantage of the fact that many students already are professionally employed in information systems. For example, instead of a consulting project and a business communications course,

students complete a master's project course that includes elements of professional communication and presenting oneself and one's brand professionally.

In addition to the core requirements of the MS program, the 30-credit online program offers options for earning a 3-course graduate certificates either in "Business Intelligence and Analytics" and "Enterprise Security and Information Assurance" concurrently with their MS degree.

Program Completion
The following table summarizes the program completion of our graduates in each year. The most recent year's figures represent a partial count (i.e., December graduates are not yet included).

Table I3: Number of Students Completing the online MS MIS degree

Year	Number of students completing program
2015	22
2016	34
2017	37
2018	32
2019	47
2020	51
2021	35
2022	50

Dual MBA/MS MIS Program
The dual degree MBA/MS MIS program combines the strengths of the MIS Department with those of the MBA program. The students also participate in the MBA program's first year cohort program that fosters the development of team building and leadership skills.

Graduate Certificate Programs
In 2010, the department launched a three-course sequence in Enterprise Security and Information Assurance as part of its *MISOnline* distance learning program. In addition, the department has a certificate in Business Intelligence and Analytics, which also has a three-course requirement.

Students may enroll in these classes as part of a stand-alone graduate certificate program, as a gateway (non-degree seeking) program to allow non-traditional master's students to qualify for admission to the full-time master's program, or an elective class as part of our graduate program. These classes are open to students in Eller's Master of Accounting (MACC) and MBA programs.

MBA Specialization in MIS
Along with an MIS class in the MBA core, MBA students have several options for a specialization in MIS, including business intelligence, information assurance, and leadership.

MS MIS Program Administration
Bill Neumann has been the director of the MS MIS program since 2008, and provides academic advising to the students.

In addition, MS students receive academic advising and career development from Wendy Weinhoff, Lyndsey Edmonds, and an academic advisor. Their responsibilities support our MS students in every phase

of their engagement with our program. Prior to a student's matriculation, our career management team assists with student recruiting and new student orientation onboarding. While in the program, our career management team engages with our MS students' professional placement and career advising (career fairs, information sessions, email, phone and personal inquiries), skill development for career placement (mock interview preparation, resume review, cover letter review, job postings, job search strategy), and enforcement of Graduate College policy on academic probation. As our MS students look ahead to their professional career, the career management team supports our students by coordinating with recruiters and supporting alumni relations. In addition, the career management team serves as a liaison to our campus colleagues such as the MBA Program, the Graduate College, and the International Programs Office.

Graduate Student Handbook
The Graduate Student Handbook is available at:
https://eller.arizona.edu/sites/default/files/MIS%20Academic%20Handbook%202022.23Final.pdf

The *MISOnline* Graduate Student Handbook is available at:
https://eller.arizona.edu/sites/default/files/MISOnline%20Student%20HandbookFinal.pdf

C. Full-time MS Students

The on-campus full-time MS MIS is our oldest master's degree program. Among our programs, it is also likely the best known, in part due to the strong rankings (ranked as the #1 graduate MIS program among public business schools by *US News & World Report*).

Recruiting and Enrollment
Students are recruited through a variety of methods. The department's ranking is a strong recruiting tool and generates applicant interest. The department's stature also encourages undergraduate institutions to recommend that their graduates apply. In addition, the departmental web page provides recruiting information about the programs, the faculty, and research activities.

The retention rates for the MS program are extremely high. Overall, the dropout rate has averaged less than one student per year over the last five years and none have left because of poor performance. Students have left the program on rare occasions to attend to personal matters.

The reputation of our program attracts applicants from around the world and from many different disciplines. Our MS program has been designed for students to start in the fall semester. Coordinated by Cinda Van Winkle, the MIS Department reviews its own applications (in 2021 applications numbered over 350; in 2022 over 450). Each applicant is considered on multiple factors that include undergraduate GPA, professional work experience, TOEFL (for international students), and performance on either the GMAT or GRE in both verbal and quantitative areas.

Inquiries from both domestic and international students dramatically increased over the past three years, as seen in Table I4. Along with the high ranking of the department, a strong placement rate for our graduates, a personal outreach program by senior faculty, and positive word-of-mouth recommendations by our current students have allowed us to continue to be more selective in our admissions process.

While the improving economic conditions have aided the department in the recruitment of international students, these same issues have made recruiting domestic students for our full-time, in-residence 18-month program more challenging. To address this issue, the department has worked with the Graduate College to offer MIS undergraduate students the option of participating in the "Accelerated Master's Program" (AMP). The AMP program is a 4+1 option that allows undergraduates to begin their course work for the master's program while still enrolled as an undergraduate. This approach not only allows students to have the option

to complete the MS program in two semesters, but it also enables students to view their graduate work as a logical extension of their studies, rather than an interruption of a career. Since most of our undergraduate students are domestic, the program is on track to increase the number of domestic students in our MS program. For reporting metrics, we include students pursuing the AMP program with other full-time students (the university analytics system also reports them together).

Table I4: MS MIS Admissions

Year	Domestic enrollees	International enrollees
2016	20	65
2017	16	70
2018	13	42
2019	13	77
2020*	11	6
2021	26	53
2022	19	64

** Affected by COVID-19*

Since the adoption of our 18-month program, we have more than doubled the enrollment in our full-time program while raising the incoming academic profile of the students. In 2022, the average incoming student has an undergraduate GPA of 3.44, a GMAT of 664 (or a GRE of 314), and more than two years' professional work experience related to information systems.

Figure I2 shows the number of applied, number admitted, and the percent enrolled of those that were admitted. Notwithstanding a strong pool of applications, recommendations, and confirmation of intent to matriculate, as noted previously, the actual 2020 matriculation were dramatically impacted by travel restrictions imposed during the COVID-19 pandemic for our international students. We also note a drop in applications that coincides with providing students an online calculator to determine whether or not their GPA (often on very different bases than 4.0) coincides with a 3.0 or higher GPA at the University of Arizona.

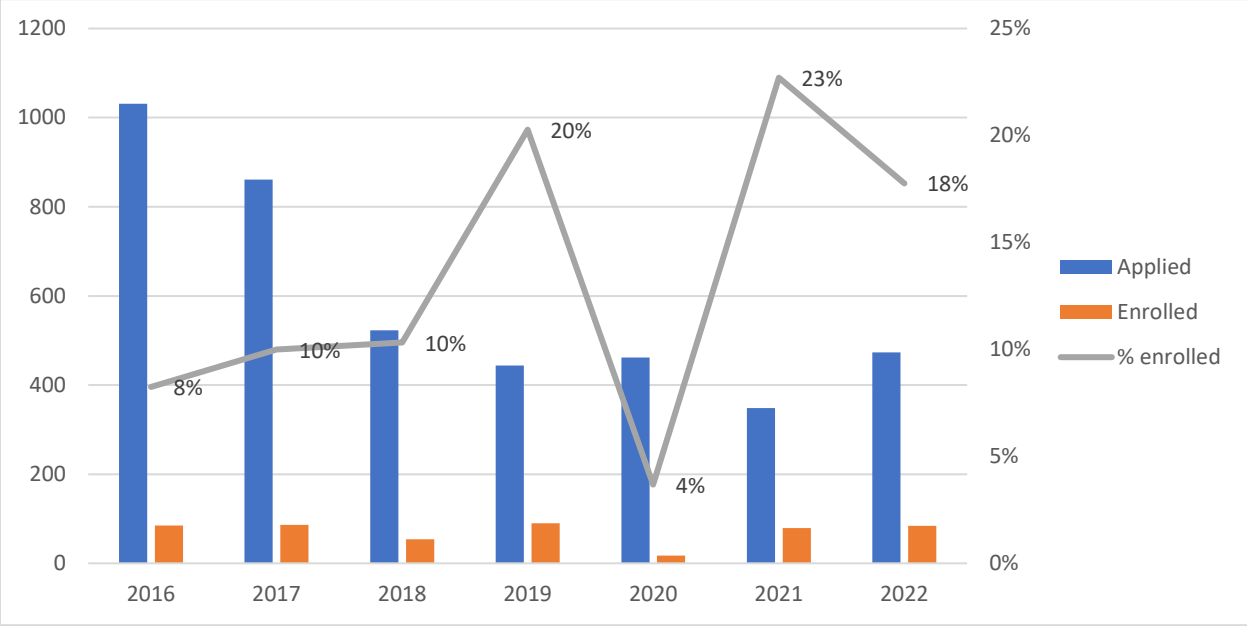


Figure I2: MS MIS Admissions statistics 2016-2022

Financial Support

The assistantships available for the master's students are more limited than those awarded to our doctoral students. Some of our MS students find assistantships in our department or in other departments for research work or support activities. In our department, it is only when we have funded all of our PhD students that we consider MS students and available assistantships. The assistantships provide a stipend, tuition waiver, and other benefits.

There is a great deal of competition among top-tier programs for the most qualified master's students. Since no assistantships are reserved specifically for MIS master's students, it is difficult to use them as a primary recruiting tool, causing us to potentially lose highly qualified applicants. As an example, the University of Texas, Dallas admits hundreds of students each year. In the state of Texas, students receiving scholarships (of even $1,000) are entitled to in-state tuition rates. This presents a significant challenge when recruiting students. Increased graduate assistantships for master's students would allow us to attract top domestic as well as international students.

In recent years, a portion of the master's degree program professional fees is returned to the department for financial need-based scholarships. Since the prior guidelines for determining if a student was qualified for these scholarships were designed for domestic students, the MIS Department, with significant support of the Eller College of Management, worked with the University's financial aid office to develop guidelines that allowed international students to also be considered. Although we must use a student's demonstrated financial need as the primary qualification, considering other factors such as service and engagement recognizes students who contribute to the success of the department through extra-curricular service and professional developmental activities.

Resources for Students

There are multiple spaces in McClelland Hall for MS MIS students. Specifically, the McKeever Lab open space is referred to as the MIS Commons. Students use this space for their work and team meetings. There is a graduate lab on the third floor of McClelland Hall that has some open space and some partitioned rooms for team meetings. All rooms are reservable. The College recently opened up a number of more private

team rooms for graduate students to reserve. These rooms are particularly important for students meeting with clients or participating in online interviews.

Additionally, MS students can apply for a limited number of scholarships to travel to and participate in the Grace Hopper Celebration of Women in Computing conference. The department is actively looking for other opportunities for students to participate in recruiting conferences. The department also sponsors one or two career treks each year to visit companies as well as one or two alumni events each year enabling students to further develop their professional networks.

Our department strives to make learning experiences as accessible as possible to students. Along with developing curriculum and instructional experiences based on Universal Design principles, our graduate students are encouraged to contact the university Disability Resource Center (DRC) to identify reasonable accommodations to ensure that they can fully participate in our program if they anticipate or experience any barriers based on disability or pregnancy.

Program Completion

The Table I5 summarizes the program completion of our graduates in each year. The most recent year's figures are lower because they represent a partial count (i.e., December graduates are not yet included). COVID-19 negatively impacted the number of matriculated students and consequently the number of graduates in 2020 and 2021.

Table I5: Number of Students Completing the full-time MS MIS degree

Year	Number of students completing program
2015	99
2016	87
2017	82
2018	88
2019	76
2020	52
2021	79
2022	37

Placement

Our average cohort size has increased since the last APR and the placement of our students has kept pace. The entire December 2021 graduating class (domestic and international students) was placed by March 2022. At graduation, 95% were placed and 100% by March. The average starting salary was $107K. The Spring 2022 graduating class is following a similar pattern, with 95% having been placed at graduation with a starting salary of just over $86K. Moreover, we have found increasing interest in our students from companies such as Ernst & Young (EY), Amazon, American Express, Microsoft, and Salesforce. The 2021 placement statistics according to geographic region are:

- Southwest: 44%
- West: 34%
- East: 19%
- Midwest: 3%
- North: 0%
- South: 0%

D. MSBA

MS in Business Analytics (MSBA) program is a collaborative program offered by the Eller College with required and elective courses from multiple Eller departments, including economics, marketing, accounting, and finance. The program leverages the quality and reputation of our full-time MS MIS program including the analytics certificate and capitalizes on the demand for business analytics training.

Recruiting and Enrollment

Students are recruited through a variety of methods including posts on social media and targeted advertising online. The MIS Department's ranking (#2 among public universities in the latest *US News & World Report*) for our flagship MS program often generates initial applicant interest. The department's stature also encourages undergraduate institutions to recommend that their graduates apply. In direct support of the MSBA program, the MIS departmental web page provides potential applicants information about the MSBA program, its faculty, and research activities.

MSBA Curriculum

With a minimum of 33 credits required for graduation, students have the option of completing the program in either 10 or 16 months. The latter option provides students an opportunity to take a broader set of electives, complete a summer internship, and better manage their course load.

The outline of our MS curriculum is shown below in Table I6. The core and elective courses are periodically reviewed to make sure they meet the needs of students and what is being demanded in the marketplace today.

Table I6: MSBA curriculum

<table>
<tr><th>Core Classes</th><th>Elective Classes</th></tr>
<tr><td>MIS 502: Technical Foundations of Analytics</td><td>MIS 531: Enterprise Data Management</td></tr>
<tr><td>MIS 545: Data Mining</td><td>MIS 587: Business Intelligence</td></tr>
<tr><td>MIS 561: Data Visualization</td><td>MIS 596a: Special Topics: Deep Learning</td></tr>
<tr><td>MIS 563: Advanced Quantitative tools for Business Analytics or ECON 511B: Econometrics</td><td>OSCM 571: Optimization for Business</td></tr>
<tr><td>MIS 584: Big Data Technologies</td><td></td></tr>
<tr><td>BNAD 515C: Introduction to Business Analytics</td><td rowspan="5">Other electives from Accounting, Economics, Finance, and Marketing (listed on website: https://eller.arizona.edu/programs/masters/business-analytics/program#curriculum)</td></tr>
<tr><td>BNAD 597A: Consulting Project</td></tr>
<tr><td>ECON 511A: Econometrics</td></tr>
<tr><td>MKTG 525: Regression Modeling for Analytics</td></tr>
<tr><td>MKTG 555E: Special Topics on Marketing</td></tr>
</table>

In our current curriculum, most of the courses are required; however, students are allowed to select among several elective classes, based upon their professional interests, such as business intelligence, marketing analytics, financial modeling, and others. If students can demonstrate to the department that their prior professional or academic experience meets the learning outcomes of a required course, then a student may seek approval from the graduate program chair to choose another course in its place.

Financial Support

Students in the MSBA program can benefit from similar financial support opportunities as students in the MS MIS on-campus program. A much sought-after opportunity is to obtain a graduate assistantship within

the department (most commonly a quarter-time appointment) which provides a stipend, tuition waiver, and other benefits. As noted for the MS MIS program, these assistantships are only made available to master's students when we have funded all PhD students.

The assistantships are applied for on a competitive basis, and the most qualified students are chosen for the position (these are often students in their second or third semester who have demonstrated their performance in first semester classes).

There is a great deal of competition among programs for the most qualified master's students. Since no assistantships are reserved specifically for master's students, it is difficult to use them as a primary recruiting tool, causing us to potentially lose highly qualified applicants. As an example, the University of Texas, Dallas admits hundreds of students each year. In the state of Texas, students receiving scholarships (of even $1,000) are entitled to in-state tuition rates. This presents a significant challenge when recruiting students. Increased graduate assistantships for master's students would allow us to attract top domestic as well as international students.

In recent years, a portion of the master's degree program professional fees is returned to the department for financial need-based scholarships. Since the prior guidelines for determining if a student was qualified for these scholarships were designed for domestic students, the MIS Department, with significant support of the Eller College of Management, worked with the University's financial aid office to develop guidelines that allowed international students to also be considered. Although we must use a student's demonstrated financial need as the primary qualification, considering other factors such as service and engagement recognize students who contribute to the success of the department through extra-curricular service and professional developmental activities.

Resources for Students

There are multiple spaces in McClelland Hall for MSBA students. Specifically, the McKeever Lab open space is referred to as the MIS Commons. Students use this space for their work and team meetings. There is a graduate lab on the third floor of McClelland Hall that has some open space and some partitioned rooms for team meetings. All rooms are reservable. The College recently opened up a number of more private team rooms for graduate students to reserve. These rooms are particularly important for students meeting with clients or participating in online interviews.

MSBA students can also apply for a limited number of scholarships to travel to and participate in the Grace Hopper Celebration of Women in Computing conference. The department is actively looking for other opportunities for students to participate in recruiting conferences. The department also sponsors one or two career treks each year to visit companies as well as one or two alumni events each year enabling students to further develop their professional networks.

Our department strives to make learning experiences as accessible as possible to students. Graduate students can contact the university Disability Resource Center (DRC) to establish reasonable accommodations if they anticipate or experience barriers based on disability or pregnancy.

Program Completion

Table I7 summarizes the program completion of our graduates in each year. The most recent year's figures include graduates through Summer of 2022.

Table I7: Number of students completing the MSBA program

Year	Number of students completing program
2020	2
2021	10
2022	10

Placement
The placement of our students has been very good. Students graduating in Spring 2020 enjoyed a 100% placement at graduation. In Fall 2020 we had 50% placement at graduation and 100% placed by January. During Spring 2021, 83% of the students were placed at graduation and 100% within 6 months after graduation. We had a 100% placement by graduation during Fall 2021. For Spring 2022, 66% of our students had a job at graduation and 100% were placed by June. The average starting salary was just over $75K. We have found increasing interest in our students from companies such as Ernst & Young (EY), Walmart, Discover, Intuit, and Deloitte.

Graduate Student Handbook
The Graduate Student Handbook for the MSBA program is available at:
https://eller.arizona.edu/sites/default/files/MSBA%20Academic%20Handbook%202022.23Final.pdf

E. MS in Cybersecurity

The online MS in Cybersecurity is a professional master's program developed in collaboration with Electrical and Computer Engineering (ECE), and Systems & Industrial Engineering (SIE). The program leverages the quality and expertise of our faculty and is designed for working IT, engineering and other professional who have existing work experience and want to boost their skills to pursue a cybersecurity career path.

Students engage in theoretical and hands-on approaches to learning the critical components of cybersecurity. Cybersecurity courses cover topics such as business intelligence data mining, information security, risk management, systems security management, penetration testing, network security, and system cybersecurity engineering.

Recruiting
Students are recruited through a variety of marketing strategies such as ad buys with Google, LinkedIn, billboards, radio, and streaming services, department and/or college sponsored booths at various events, and social media postings via the MIS Department's accounts. Although our program is relatively new, its quality has been reflected in our rankings. The latest *US News* rankings had us as the #2 public and #5 overall ranked program. *Fortune* magazine's education's ranking had our online Master's in Cybersecurity ranked as #3 among public universities and #6 overall. The quality of our cybersecurity program in is a strong recruiting tool and generates applicant interest. The program is jointly offered by three of the strongest departments at the University of Arizona, i.e., MIS, Electrical and Computer Engineering and Systems and Industrial Engineering. This encourages undergraduate institutions to recommend that their graduates apply. In addition, the departmental web pages of the collaborating departments provide recruiting information about the programs, the faculty, and research activities.

The retention rates for the MS program are extremely high. With the launch of the MS Cybersecurity program in Fall 2017, the average retention rate (students having re-enrolled or graduated at any time within 12 months from their first enrolled into the program) is 97%.

Cybersecurity Curriculum
With a minimum of 33 credits required for graduation, students have the option of pursuing two tracks to completion: Information Systems and Physical Systems. Both tracks require 12 units of a Common Core and 21 units in their selected track. Courses from either track can fulfill elective requirements within both tracks.

The outline of our MS curriculum is shown in Table I8. The core and elective courses are periodically reviewed to make sure they meet the needs of students and what is being demanded in the marketplace today.

Table I8: Cybersecurity curriculum

Common Core (12 units)	
MIS 515: Information Security in Public and Private Sectors	
MIS 543: Business Data Communications and Networking	
SIE 571: Systems Cyber Security Engineering	
SIE 573: Engineering of Trustworthy Secure Systems	
Information Systems (21 units)	**Physical Systems (21 units)**
Required	**Electives**
MIS 516: Information Security Risk Management	ECE 509: Cyber Security: Concepts, Theory, Practice
MIS 517: Systems Security Management	ECE 523: Machine Learning and Data Analytics
MIS 545: Data Mining for Business Intelligence	ECE 524: Fundamentals of Cloud Security
MIS 562: Cyber Threat Intelligence	SIE 530: Engineering Statistics
MIS 566: Penetration Testing: Ethical Hacking and Social Engineering	ECE 535A: Digital Communications Systems
MIS 689: Cyber Warfare Capstone	SIE 554A: Systems Engineering Process
	ECE 571: Fundamentals of Information and Network Security
Electives	SIE 572: Information Security and Research (INSuRE)
MIS 511: Social and Ethical Issues of the Internet	
MIS 578: Project Management	

In our current curriculum, most of the courses in the Information Systems track are required. However, students are allowed to select among elective classes both from the Information Systems and Physical Systems track based on their professional interests.

Financial Support and Resources available
College funded aid is not available for online MS Cybersecurity students. That said, there are a number of corporate sponsorships both through Eller College and Arizona Online that offer incentives for the program. Students who are looking for financial aid are directed to complete the FAFSA and apply for scholarships via Scholarship Universe: https://online.arizona.edu/cost-aid/financial-aid. In addition, many of our students use employee education benefits related to their full-time position.

Cybersecurity students receive a weekly newsletter in the spring and fall semesters to make them aware of resources available to them, including but not limited employer information sessions, virtual and in-person

career fairs, webinars, online workshops via Think Tank, conferences, and job postings. The Director of MIS Online programs holds weekly advising virtual office hours for students to set up one-on-one appointments.

Cybersecurity students are encouraged to participate in the National Cyber League games. We also let students know about department and campus level resources available to them and recommend taking advantage of them. These include the services offered by the Student Engagement & Career Development office, such as the job board Handshake. Students can also take advantage of help from the MIS Department's Career Services team for résumé reviews and other services.

Program Completion
Table I9 summarizes the program completion of our graduates in each year. The most recent year's figures represent a partial count (i.e., December graduates are not yet included).

Table I9: Number of students completing MS in Cybersecurity program

Year	Number of students completing program
2019	5
2020	19
2021	25
2022	29

Placement
Most of the students in the online program are working professionals, and they complete the program on a part-time basis while continuing to work with their employer, i.e., employment or placement is not an issue for them. With the opportunities the program opens up to our students, many of them have changed jobs, received a raise and/or promotion before graduating. As the online program is designed with flexibility in mind, our students graduate in Fall, Spring, and Summer. Of our 2020-21 graduates that were seeking a new job, 70% were placed by their graduation date and 100% no more than 6 months after graduation.

Graduate Student Handbook
The Graduate Student Handbook for the online MS in Cybersecurity is available at: https://cybersecurity.arizona.edu/wp-content/uploads/2022/09/Online-Cybersecurity-Student-HandbookFinal.pdf

F. Doctoral Program

The MIS Department has prided itself on producing the largest number of doctoral graduates in the country (over 290 in the last 48 years). They have chosen not only academic careers, but also research careers in government and private organizations. In general, the doctoral program provides training for careers in teaching and research in information systems. A significant number of students have focused on design science research, due to the multitude of grants that have supported our research work. With our most recent hires, the department has added depth and breadth in terms of research areas covered. Students joining the program today can still focus on design science issues, but they now also have support for research in behavioral and economic aspects of information systems.

At the doctoral level, multiple opportunities exist for active involvement in learning. Students are required to teach at least two courses prior to graduating, as teaching experience is often required for academic

placement in the information systems field. Teaching also supports the development of a student's understanding of the field by educating others. All doctoral students participate in research activities as required by their written preliminary examination at the end of their second year. Most are supported by research funding and participate in funded projects under the advisement of a faculty advisor.

Doctoral Admissions

One of the admission criteria for the MIS PhD program is the GMAT or GRE score. Average GMAT scores of admitted doctoral students are shown below in Figure I3. The average GMAT scores are similar to what is seen in the previous APR.

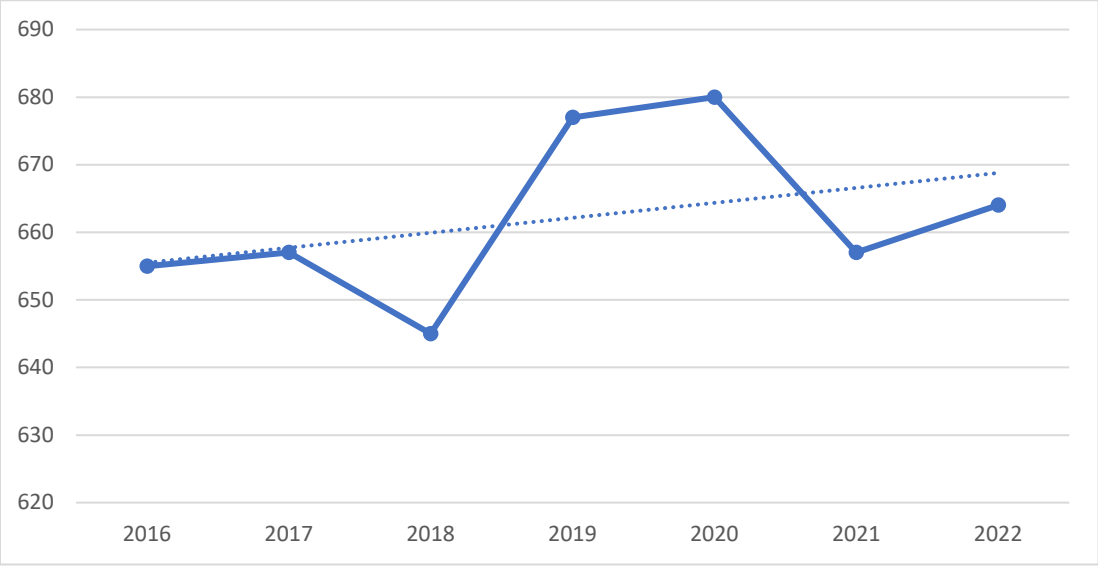


Figure I3: Average GMAT score for admitted doctoral students 2016-2022

The number of students applying for admission to the program shows some fluctuations in the past few years as shown in Figure I4. The number of students admitted has often relied on funding sources.

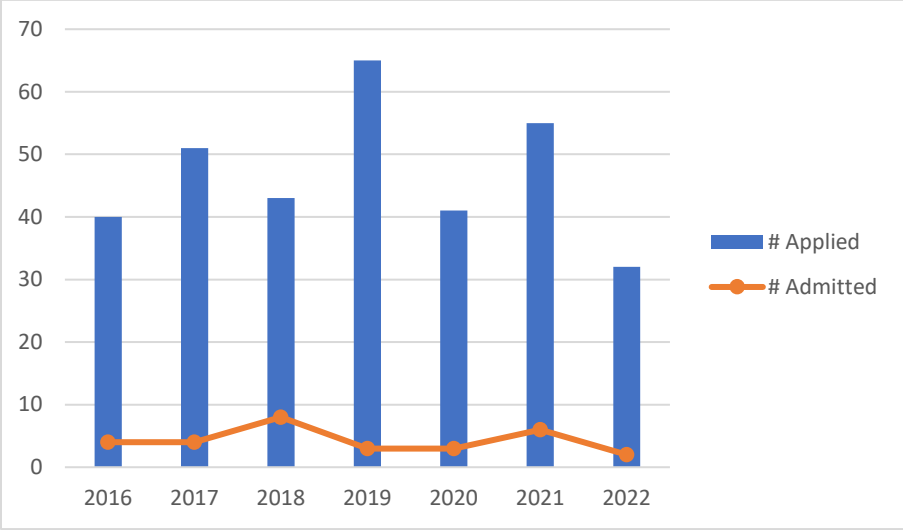


Figure I4: Number of applications to the MIS doctoral program and number of applicants enrolled

Student Profile
The student profile in our program is similar to that in other MIS programs.

The student ethnic profile from 2014-2021 is shown below in Figure I5.

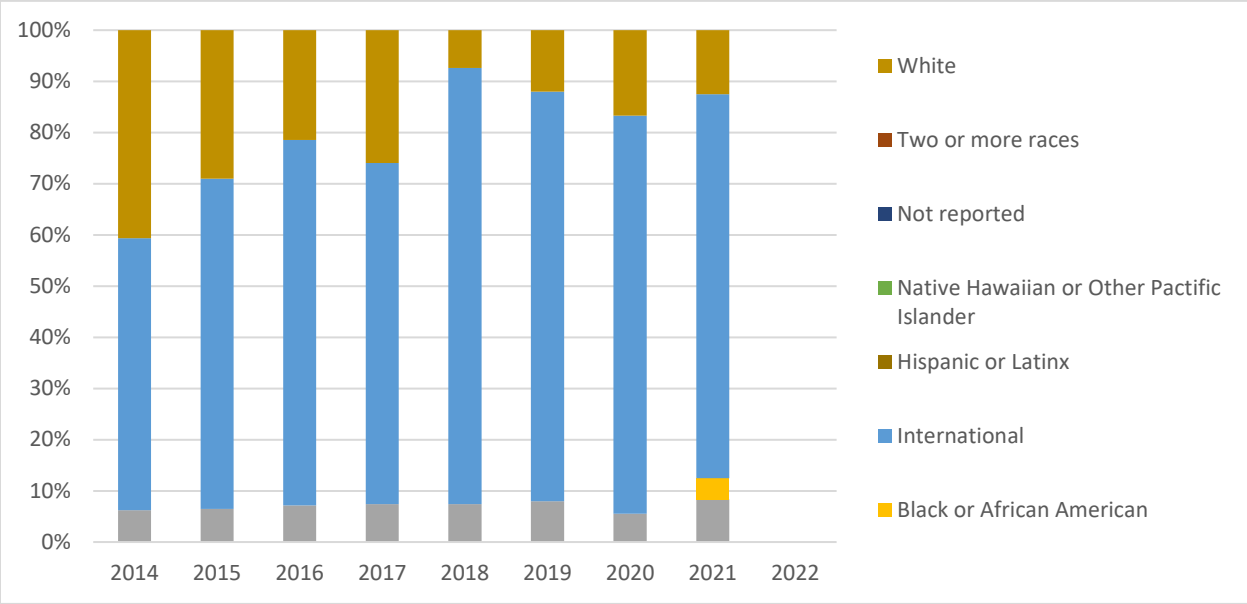


Figure I5: Self-reported ethnic profile of MIS doctoral students enrolled Fall 2014-2021

The average percent of enrolled PhD students who are female has declined slightly (from 23% to 21.7%) from the previous APR period and is shown in Table I10. The decline is reflective of the decline in female applicants. We do note a positive trend in the past three years and are working diligently to continue it.

Table I10: Percentage of female enrolled students in the MIS doctoral program 2014-2021

YEAR	Percent of enrolled students who are female
2014	18.75
2015	19.35
2016	17.86
2017	18.52
2018	22.22
2019	20.00
2020	27.78
2021	29.17

Doctoral Advising
The MIS Department has a doctoral committee that specifically oversees the PhD program. The chairperson of the doctoral committee is responsible for doctoral student general advising and an annual evaluation. Since most of our PhD students are admitted directly to a research lab, they also have the opportunity to work with their dissertation advisor from the beginning of their doctoral studies.

Doctoral students pick dissertation advisors from the tenured and tenure-eligible faculty in the department. Currently, we have 22 doctoral students and 14 tenure-track faculty, or a student/faculty ratio of 1.57. Doctoral students work closely with their dissertation advisor (the advisor is usually selected in the first year of PhD studies).

Students in their first three years of the program are required to attend a department research workshop for credit. They must attend at least 70% of the presentations and write a two-page reflection paper in which they discuss a theme in the seminars that they found interesting or identify a particular seminar or seminars they found interesting and include a discussion of why it was interesting and how it has impacted or will impact their research.

Doctoral students complete an annual report each February. The annual report provides an opportunity for students to reflect and identify areas in which they need improvement going forward. The faculty on the doctoral committee assess each student's progress toward graduation and provide written feedback on areas the students need to address. Students must complete the annual report to receive funding in the following year.

Scholarly Activities

It is a tradition of the department that PhD students co-author with their faculty. Most of our students graduate with at least one conference publication. Some students have more than one publication before graduation including an accepted journal paper.

Doctoral Student Review and Retention

In addition to completing an annual review, students in the doctoral program are also evaluated on MIS-related knowledge and research through a core exam at the end of their first year, and a written preliminary exam in the Fall semester of their third year. Students may be asked to leave the program if they fail their core exam. On average, one doctoral student per year leaves the program, either due to not passing the core or choosing to leave the program after realizing what it means to get a PhD. Some of these students have opted to receive a master's degree. The annual review is also an opportunity to counsel students out of the program if they are not progressing as expected.

Doctoral Student Exit Interview

The University of Arizona Graduate College administers an exit survey to students upon graduation. The details of the survey are provided in Appendix I1. The results of the survey are overall quite positive for the MIS PhD program. About 88% of respondents indicated that their overall experience was very good or excellent, with the other 12% classifying it as good. Over 90% of respondents would recommend the program, and over 80% rated the overall quality of the curriculum to be very good or excellent. Students felt they received adequate information about the program and climate was assessed positively (90% or higher on all dimensions in agree or strongly agree). Support was assessed favorably, with financial support receiving the lowest assessment, but still over 73% indicating it was very good or excellent. Advisors were assessed favorably, with the one exception regarding non-academic career advice; this is a rare circumstance in the department. Just under 70% of respondents indicated that they received training in instructional methods, and 100% of them found the training somewhat or very helpful. Respondents felt that their needs and interests were considered when making assignments (100%) and about 88% indicated that the teaching experience was adequate preparation for their career. Although about 88% indicated that they were properly prepared and training before entering the classroom, only 20% indicated that they were appropriate supervised in a way that would help improve their skills. Finally, 100% indicated that the RA experience was somewhat or very helpful with respect to their professional development and about 83% indicated that they worked about the right number of hours in the position. After reviewing the results, the department

intends to benchmark funding and develop a plan for more proactive training and mentoring of the students with regard to teaching.

Doctoral Program Minors
All our MIS doctoral students take courses outside the department to fulfill requirements for their doctoral minors. Students mainly have minored in Cognitive Science, Computer Science, Education Psychology, Communication, Electrical and Computer Engineering, Management and Policy, and Sociology. Coordination has been through dissertation committee members, who also resolve any issues that arise in coursework or research.

Since 2016 we have had 12 students from other disciplines complete their PhD with a minor in MIS.

Doctoral Completion and Placement
The degree completion and placement of our MIS PhD students in the last seven years is shown in Appendix I2. The department, due to its systems/technology development and evaluation focus, has always produced a mix of students that have varied interests: systems development, research, and teaching. This has led to our students joining companies such as Google, research organizations such as IBM Research, and teaching institutions, as well as the traditional research institutions such as University of Georgia, Arizona State University, Purdue University, the University of Massachusetts, and the University of Oklahoma.

UAIR informed us that the six- and eight-year completion rate reports will not be available in time for the APR review. However, we do know that 100% of our students have completed within eight years. Our six-year completion rate is approximately 95%, largely due to COVID-related delays.

Resources to Support Students
All doctoral students are provided assistantships either for assisting faculty teaching or for sponsored research activities. Sponsored research projects also help provide support primarily for the research activities of doctoral students. The remaining doctoral students are funded by state grants. The proportion of doctoral students funded by outside grants and state funds for 2017-2022 is shown below in Table I11.

Table I11: Sources of doctoral student funding

Fall 2016	Salary	ERE 13.4%	Tuition	Percent		**Spring 2017**	Salary	ERE 13.4%	Tuition	Percent
State	$ 89,527	$ 11,997	$50,162	39 %		State	$ 80,330	$ 10,764	$36,206	30 %
Grant	$ 138,636	$ 18,577	$83,447	61 %		Grant	$188,082	$ 25,203	$92,531	70 %
Total	$ 228,163	$ 30,574	$133,609			Total	$268,412	$ 35,967	$128,737	
Fall 2017	Salary	ERE 13%	Tuition	Percent		**Spring 2018**	Salary	ERE 13%	Tuition	Percent
State	$ 115,725	$ 15,044	$59,393	50 %		State	$107,893	$ 14,026	$42,621	33 %
Grant	$ 116,443	$ 15,138	$60,783	50 %		Grant	$217,705	$ 28,302	$96,621	67 %
Total	$ 232,168	$ 30,182	$120,176			Total	$325,598	$ 42,328	$139,242	
Fall 2018	Salary	ERE 14.1%	Tuition	Percent		**Spring 2019**	Salary	ERE 14.1%	Tuition	Percent
State	$ 122,491	$ 17,271	$57,803	39 %		State	$ 81,790	$ 11,532	$37,225	27 %
Grant	$ 193,152	$ 27,234	$84,399	61 %		Grant	$226,223	$ 31,897	$91,240	73 %
Total	$ 315,643	$ 44,505	$142,202			Total	$308,013	$ 43,429	$128,465	

Fall 2019	Salary	ERE 11%	Tuition	Percent		**Spring 2020**	Salary	ERE 11%	Tuition	Percent
State	$ 124,688	$ 13,716	$58,532	54 %		State	$123,281	$ 13,561	$51,420	49 %
Grant	$ 104,738	$ 11,521	$48,071	46 %		Grant	$128,419	$ 14,126	$52,199	51 %
Total	$ 229,426	$ 25,237	$106,603			Total	$251,700	$ 27,687	$103,619	
Fall 2020	Salary	ERE 11.1%	Tuition	Percent		**Spring 2021**	Salary	ERE 11.1%	Tuition	Percent
State	$ 115,188	$ 12,786	$54,921	72 %		State	$139,625	$ 15,499	$60,979	63 %
Grant	$ 43,250	$ 4,801	$23,324	28 %		Grant	$ 80,875	$ 8,977	$35,391	37 %
Total	$ 158,438	$ 17,587	$78,245			Total	$220,500	$ 24,476	$96,370	
Fall 2021	Salary	ERE 12.7%	Tuition	Percent		**Spring 2022**	Salary	ERE 12.7%	Tuition	Percent
State	$ 78,731	$ 9,999	$36,324	37 %		State	$131,963	$ 16,759	$56,862	53 %
Grant	$ 131,644	$ 16,719	$64,857	63 %		Grant	$114,750	$ 14,573	$48,861	47 %
Total	$ 210,375	$ 26,718	$101,181			Total	$246,713	$ 31,332	$105,723	
Fall 2022	Salary	ERE 13%	Tuition	Percent		**Spring 2023**[4]	Salary	ERE 13%	Tuition	Percent
State	$ 81,950	$ 10,654	$38,697	32 %		State	$ 98,063	$ 12,748	$46,305	38 %
Grant	$ 173,012	$ 22,492	$81,696	68 %		Grant	$ 156,900	$ 20,397	$74,088	62 %
Total	$ 254,962	$ 33,146	$120,393			Total	$ 254,963	$ 33,145	$120,393	

At the doctoral level, all students are provided with half-time assistantships. These assistantships provide a stipend and a non-resident tuition waiver. The stipend level is generally low in comparison with other top MIS programs such as the University of Minnesota and University of Maryland. Some of these differences may be based on cost-of-living considerations; however, they do have an impact on our ability to attract high quality PhD students.

Funding for doctoral student travel is most commonly available through sponsored projects. Students working in the funded projects have their travel covered when participating in conferences associated with grant-related research. The department currently provides each doctoral student with a travel and research fund, also known as the PhD Achievement Fund (PAF). This account is managed by the student and is used only for expenses allowed by the university to support research or travel.

The PAF is funded as follows:

- When a student begins the program, $500 is added to their PAF
- When a student passes the core exam, $1000 is added to their PAF
- When a student completes the prelim, $1000 is added to their PAF
- When a student passes the oral exam, $1000 is added to their PAF

[4] Amounts for spring 2023 are projected

- When a student is in their final year (i.e., on the market), $1500 is added to their PAF

There are additional opportunities to gain funding for student research-related travel, through annual competitions for:

- Alan Dennis Award (2 awards of $500 each),
- Sy Goodman Award ($500),
- Samtani-Garcia Award (2 awards of $500 each).

When awarded, these funds are deposited in the student's bursar account. The department's ICIS Doctoral Consortium designee (as nominated by the department and selected by ICIS) also receives funding to attend and participate in the ICIS conference (participation in any additional ancillary conferences is covered by the student).

Students also have access to University GPSC travel funding up to $750 per year. The department encourages students to apply for these funds to aid their participation in various conferences and research activities.

Most doctoral students work in carrels available in the department suite. They have private locked areas in which to store computers and books.

Doctoral Coursework

The MIS PhD degree requires a major in MIS plus a minor in a related discipline from another department. The major coursework consists of a set of core courses (21 units) that include MIS-related methodology courses, quantitative methods (9 units), specialization (6 units), and Research Workshop (9 units). The requirements are shown in Table I12.

Table I12: MIS Doctoral program requirements

Requirements	Courses
CORE (21 units required)	MIS 531: Enterprise Database Management MIS 611A: Design Science Research Methodologies MIS 611B: Behavioral Research Methodologies MIS 611C: Economics of Information Systems MIS 611D: Topics in Data and Web Mining MIS 615: Network Science: Theory and Applications MIS 696A: Readings in MIS
QUANTITATIVE METHODS (6 units required)	MIS 601: Statistical Foundations of Machine Learning The student should consult his/her major advisor to select two additional quantitative methods courses.
SPECIALIZATION (6 units required)	The student should consult his/her major advisor to select two courses that contain the basic knowledge in a chosen area of specialization such as Information Technology, Information Economics, Management and Organization, Quantitative Methods, and Operations Management.
RESEARCH WORKSHOP (6 units required)	MIS699: Research Workshop

DOCTORAL MINOR	The minor requirements are determined by the department that offers the minor. Popular minors include cognitive science, computer science, economics, linguistics, and management.

Doctoral Program Going Forward
Three key activities are planned with respect to the doctoral program. First, we are revisiting the timing of courses. A major issue in the program is that students have a fairly heavy load of MIS courses in their first year. This means that most students do not take statistics courses until their second year in the program. We believe this has a negative impact on students' abilities to do research in their first year, effectively putting them a year behind their colleagues in other programs. Adjustments to the curriculum to enable students to take statistics in their first year need to be made. In conjunction with this, the doctoral committee is reviewing the statistics offerings on campus in order to recommend the courses that will be most beneficial for the students in our program.

Second, we are exploring postponing the core exam until the end of the second year. With fewer students joining the doctoral program each year, it is not financially sustainable to offer the core classes each year. By postponing the core exam to year two, we would be able to free up time in year one for students to take stats classes (see point one above).

Third, we are in the process of comparing our funding structure (stipend and travel support) to that of other programs. The market for top quality doctoral students in MIS is very competitive. In order to continue to attract the best and the brightest, we must address inequities in the funding structure that would make the University of Arizona appear less attractive to a potential applicant.

Doctoral Student Handbook
The Doctoral Student Handbook is available at:
https://eller.arizona.edu/sites/default/files/MIS%20Doctoral%20Handbook%202022.23.pdf

G. Assessment

MS MIS Program
URL: https://www.taskstream.com/ts/msmanagementinformationsystems/Assessment
Password: MSMIS

MSBA Program
URL: https://www.taskstream.com/ts/msbusinessanalytics/Assessment
Password: MSBA

PhD in MIS Program
URL: https://www.taskstream.com/ts/phdmanagementinformationsystems/Assessment
Password: PHDMIS

Reflection on Program Improvements and Student Learning
We have been collecting direct and indirect data measures and overall, the results have been satisfactory since the last APR. In other words, our findings provide evidence that students are meeting desired learning outcomes. There have been a few occasions where students did not meet learning outcomes, and appropriate measures were taken to address those concerns in the following assessment cycle. For example, a drop was

noticed in student performance during 2013-2014. The drop provided an input for focus during 2015 and there was an improvement seen in the following year's results. As another example, our doctoral students were encouraged to pursue the University Teaching Certificate (to satisfy the outcome related to demonstrating effectiveness in teaching).

Modifying Analysis to Identify Achievement Gaps

At present, our findings show that student learning outcomes are consistently being satisfied. Our programs also have a strong retention rate. Additionally, students are enjoying strong placement success after graduation, and our program rankings have remained strong. However, we do not see this as a reason to be complacent. We understand that we are in a competitive marketplace for future students and want to do our best to satisfy our mission of providing high-quality MIS graduate education.

Accordingly, our department graduate and doctoral committees continue to make changes and improvements to the curriculum and program to better meet the needs of the students. The graduate committee is in the process of addressing programming language and course selection related requests. The possibility of a product management class/concentration is being discussed. The doctoral committee is also examining adjustments to the curriculum to enable students to take statistics in their first year. The committee is reviewing the statistics offerings on campus to recommend the courses that will be beneficial for the students in our program. Finally, we are working to develop a more consistent process for mentoring doctoral students in their teaching. We feel these efforts will benefit students across demographic groups.

J. ACADEMIC OUTREACH

MIS teaching and research is ultimately aimed at producing and informing practicing professionals in an area where change is constant. Therefore, for an academic MIS department to flourish it is necessary that it be tightly connected to the wider professional community. Towards this end, the MIS Department at Eller is involved in many efforts that facilitate the transfer of knowledge both to and from the wider community. Several of these efforts are described below.

1. The MIS Advisory Board

Established in the summer of 1998, the UA MIS Board of Advisors provides an effective mechanism for communication and collaboration between the UA MIS Department and its business partners. This has facilitated a level of counsel and support which has increased the value of the partnership and has provided the context to explore synergies, capabilities, and joint opportunities. By providing counsel and support, Board Members and the UA MIS Department have become true partners in helping the MIS Department in its education, research, and broad-based community outreach and service.

The board meets twice a year. The following is a list of the current members of the MIS Advisory Board:

Rajesh Ayyappan Menon
Chief Marketing Officer
Tavant

Joelle Benson
Area Vice President, Workspace Solutions Group
Enterprise Acquisition
Dell EMC Global Compute & Client Solutions

P. Steve Cabello
Managing Director
Protiviti Inc.

Julie Dillon
Vice President
American Express

Brian Ellerman
Founding Director
Arizona FORGE

Jim Gibson
Vice President, Professional Services
ClearDATA

Brian Huston
Senior Manager, Consulting
EY (Ernst & Young, LLP)

Kripa Krishnan
Director, Cloud Product Operations
Google, Inc.

Jeff McKeever
Founder and Chief Mentor
MicroAge

Manos Menayas
Executive Coach

Jagadish Ramamurthy
Ads Insights TL
Pinterest

John Ratzan (Board Chair)
Managing Director – NY Partner
Accenture

Calline Sanchez
Vice President, IBM WW Systems Lab Services
& Technical Universities
IBM Corporation

Ron Schott
Executive Emeritus
Arizona Tech Council

Adam Stafford
Principal
PricewaterhouseCoopers (PwC)

Cheryl Whitis
VP IT & CIO
Raytheon Missile Systems

Srini Venkataramani
Senior Product Manager
LinkedIn

Stephen Zipperman
VP Consulting
Cloud + Data Center Transformation at Insight

2. The Cybersecurity Advisory Board

Established in the spring of 2022, the UA Cybersecurity Board of Advisors provides an important mechanism for ensuring that the MS Cybersecurity program is addressing the needs of industry and the State of Arizona. This new board has facilitated a level of counsel and support that is aimed at addressing critical cybersecurity training gaps. By providing counsel and support, Board Members and the UA MIS Department have become true partners in helping the MIS Department in its cybersecurity education, research, and broad-based community outreach and service.

The board meets in person once a year, with additional virtual meetings as needed. The following is a list of the current members of the Cybersecurity Advisory Board:

Lanita Collette
CISO and Deputy CIO
University of Arizona

Manny Felix
Founder & CEO, AZ Cyber Initiative
Partner Architect, Synack, Inc.

Rachel Harpley
Founder and Talent Advisor in InfoSec
Recruit Bit Security

Peter Kim
CISO
Raytheon Missiles & Defense

Dominic Ortega
VP Cyber Threat and Incident Response
American Express

Tim Roemer
Director, Arizona Department of Homeland Security
CISO, State of Arizona

Marnie Wilking
Global Head of Security and IT Risk Management
Wayfair

3. Student Projects

One way utilized by the department to facilitate information flow is through the time honored, client facing class project. This interaction leads to knowledge transfer in both directions. The clients benefit from the knowledge of the latest material being taught in a top-ranked MIS department and the students and faculty benefit from the experience of dealing with the technology and organizational issues of real organizations facing real issues and opportunities. In addition to the consulting projects described next, many of the courses in our programs involve actual clients and/or real problems and data provided by clients.

Eller Business Consulting Projects

The MIS Department launched MIS projects with the course MIS 688. It was introduced in 2010 to replace the individual master's project for the MS MIS program. The purpose of this required course in the master's program was to provide the MS MIS students with a semester long, in-depth project experience with a business, nonprofit, or government organizations. In 2018, the MIS Department began partnering with Eller Business Consulting and Business Communications to offer the project-based experiential learning experience. The mixed-discipline teams of 4-7 graduate students collaborate with organizations to solve real business problems resulting in significant value added. Through this collaboration, graduate students in MIS, Business Analytics, and full-time MBA programs are now required to participate in semester-long projects resulting in a more realistic work experience for the students.

BNAD 597A: Projects replaces MIS 688 and is offered in the spring semester, while MIS 509: Strategic Communications is offered in the fall. MIS 509 is required for the MIS and Business Analytics graduate students as a pre-requisite for the projects class. This provides the students with the problem-solving and communications skills needed to succeed in landing summer internships and full-time employment.

The Business Consulting projects are tailored to real-world challenges in the business sectors of consulting, consumer goods and services, defense, energy, healthcare, mining, manufacturing, public and nonprofit, real estate, senior living, and information technology. Projects are evaluated based on:

- Quality of the learning experience for the students
- Project scope, available resources (project sponsor), time, and effort required to complete a professional solution
- Required skillset of the students needed to complete the project

Core Faculty, who serve as Subject Matter Experts, are assigned to project teams based on the project scope and required expertise. The students benefit from the project experience by working with a real client, practicing their problem-solving, communication, client and project management skills, and networking. Each team meets weekly with their project sponsor to discuss the project status, challenges, or information/data requests. The teams deliver both midterm and final presentations describing their work. Final deliverables are shared at the end of the semester based upon the project scope.

The Business Consulting program has successfully completed over 100 projects with organizations such as Samsung, Intel, Microsoft, Tucson Electric Power, Raytheon, Rio Tinto, Mister Car Wash, Watermark, San Diego Gas & Electric, First American, Blue Cross Blue Shield of Arizona, Banner Health, City of Phoenix, Ronald McDonald House Charities, Big Brothers Big Sisters of Southern Arizona, and many others.

Sample Project topics include:

- Data analysis and visualizations

- Workflow analysis and design, process improvement
- Market analysis on potential business growth, product viability, and sales
- Review existing KPI and existing performance data to identify new KPI
- Evaluate expansion scenarios
- Recommendations for launching a sustainability program
- Conduct competitive analysis on content offerings
- Identify internal processes as candidates for Robotic Process Automation
- Technology assessment and recommendations

Based on surveys and conversations with clients, the projects create good value for their organizations.

BNAD 597A is a required course offered in the spring semester (i.e., second semester) of the first year of the on campus graduate programs. BNAD 597B is an elective course offered in the fall semester (i.e., third semester) of the graduate programs. Select MS MIS, MSBA (on the 16-month plan), TLP, and Dual-degree students opt to participate in the class. To participate, students must have successfully completed BNAD 597A.

4. Certificates

The MIS Department provides specialized knowledge through certifications. They can be an important component of a career education programs as they provide evidence of skill attainment. They are a non-degree program designed to provide students specialized knowledge that is less extensive than, and different from, our in residence or *MISOnline* master's program.

Earning a certification provides a highly valued professional credential. Certificates contain three graduate-level courses and each certificate can be completed in a five-month time period. *MISOnline* offers both “for-credit” and “non-credit” student statuses.

MIS offers two online certificates: Enterprise Security and Business Intelligence and Analytics.

The *MISOnline Enterprise Security Certificate* addresses top IT concerns with courses designed specifically for information security professionals within both industry and government. Students will gain the critical knowledge that is needed to secure information and information systems in the areas of confidentiality, integrity, and availability. The certificate leverages The MIS Department’s designation, by the National Security Agency (NSA) and the Department of Homeland Security, as a Center of Academic Excellence in Information Assurance Education (CAE-IAE).

Courses in the certificate include:

- MIS 515: Information Security in Public and Private Sectors
- MIS 516: Information Security, Risk Management, Disaster Recovery
- MIS 517: Systems Security Management

The *Business Intelligence and Analytics (BI) Certificate* is designed for IT professionals, project managers, business analysts, and marketing analysts and researchers and assists these professionals in identifying data securing methods, aligning BI initiatives with strategic goals, modeling and analyzing data for strategic decision making, and leveraging productive analytical techniques that drive better risk assessments and business potential. The BI Certificate provides a broad overview of managerial, strategic, and technical issues associated with business intelligence and data warehouse design, implementation,

and utilization. It gives students the fundamentals of database mining, analysis, design, and implementation with an emphasis on practical aspects of business process analysis and information delivery.

Courses in the certificate include:

- MIS 545: Data Mining for Business Intelligence
- MIS 584: Big Data Technologies
- MIS 587: Business Intelligence

5. Online Master's Programs

In the spring of 2013, the University of Arizona's online MS MIS degree was launched. In fall of 2017, the online MS Cybersecurity program was launched. Both programs enable students anywhere to access the top-five ranking, world-renowned faculty, and cutting-edge curriculum from the convenience of their home or office. These programs have been a major step forward in the academic outreach efforts of the MIS Department.

The online Master's in MIS consists of ten (10) three-credit courses that cover topics such as enterprise data management, business intelligence, data mining, information security and risk management, information systems analysis and design, IT business foundations, systems security management, and software design. In addition, students can earn two certificates in Enterprise Security and Business Intelligence at the completion of the master's degree program.

The online Master's in Cybersecurity consists of eleven (11) three-hour courses that cover topics such as information security and risk management, penetration testing, cyber threat intelligence, and cyberwarfare. Students have the choice to pursue an information systems track (through the MIS Department's course offerings) or a physical systems track (through offerings in the College of Engineering). In addition, students can earn a certificate in Enterprise Security.

Admission into the MS MIS and MS Cybersecurity online programs occurs on a rolling basis with the flexibility of students applying anytime throughout the year. Each course is 8 weeks in length, which allows a student to complete the MS MIS degree in ten months or the MS Cybersecurity in twelve months by taking two online courses each traditional University academic semester.

6. Technology Transfer

All of the research in the MIS Department, conducted in research centers by individual faculty, offers potential benefits to society as a whole. However, some of the large-funded research projects are addressed towards issues of particular concern in the State of Arizona. Since the last review, Joe Valacich has launched a new company, Neuro-ID.

Joe Valacich and Jeff Jenkins (prior University of Arizona PhD student and now Associate Professor at BYU) began their research together in 2011 in the University of Arizona MIS Department, along with a small group of collaborators from around the world, to analyze fine-grained human-computer interaction (HCI) data (e.g., mouse movements at millisecond precision) to better understand the end-user online experience. After years of intense research, they invented and enabled the technology that is today called *Human Analytics* (TM) and co-founded Neuro-ID (see www.Neuro-ID.com) in 2014. The patented software monitors, analyzes, and scores HCI data by evaluating ***how*** various types of information are entered into an online form, like a loan application, or ***how*** a person interacts with a website, such as

going through an e-commerce purchasing process (see Valacich and Jenkins, 2019; Valacich and Jenkins, 2020 for details on these patents). These rich behavioral data, i.e., *how a person clicks, types, and swipes* without collecting any personally identifying information (PII) – helps identify possible fraud (e.g., excessive edits, unusual answering behavior, etc.) and friction (e.g., navigation or data entry confusion), and gives Neuro-ID's customers the ability to better identify genuine customers, who are often misclassified as risky or possibly fraudulent. In sum, Neuro-ID's solutions give organizations actionable insights that were previously unavailable, that can be acted upon in real-time.

Today, having captured and translated several trillion behavioral data points in commercial production, equating to several hundred million independent individuals, Neuro-ID's technology delivers real-time predictive scores, data attributes for decisioning, and predictive modeling, as well as the industry's first index of digital friction. Neuro-ID provides these analytics through its Behavior-as-a-Service platform, which is offered as a subscription service and includes API and dashboard access. Leading Neuro-ID customers include Affirm, Alloy, TransUnion, Square, QisstPay, Plaid, FICO, VISA, Simpl, Addi, OppFi, Cortex, Elevate, elephant, Intuit and many others in various verticals (e.g., Buy Now/Pay Later, Payments, Insurance, etc.). In hypergrowth mode, new customers are added weekly.

Neuro-ID was initially funded by friends/family and angel investors. Over the last number of years, the company far exceeds the definition of "hypergrowth" (defined as 40% year-over-year growth), maintaining over a 300% average annual growth rate year-over-year for the past three years. With such rapid growth, Neuro-ID completed a Series A funding round in late 2020 ($7.5M) and a Series B ($35M) in fall 2021 from leading venture capital investors (https://www.crunchbase.com/organization/neuro-id). To date, Neuro-ID has raised $50M from both institutional and private investors and has more than 80 employees.

K. COLLABORATION WITH OTHER UNITS

Information Systems as a discipline is interdisciplinary in nature. Since its inception, the Department of MIS has played very important roles in collaborating with other units of the Eller College and the University. These associations range from formal class requirements in academic programs and interdisciplinary research to individual faculty participation in College and University initiatives. Several examples of this collaboration by MIS are documented below.

1. Eller College Undergraduate Programs

MIS offers two majors, Management Information Systems (MIS) and Operations and Supply Chain Management (OSCM), through the Eller College's Bachelor of Science in Business Administration (BSBA). MIS is the larger major. OSCM is often selected as a complementary major with MIS and other disciplines. In addition to the specific MIS and OSCM required and elective courses for these two majors, MIS provides three courses and a skills lab that are required for all recipients of the BSBA degree:

MIS 111: Computers and Internetworked Society (3 units)
This course introduces students to concepts of computer technology and the impacts of the Internet on social, organizational, personal and ethical issues. Students develop a sufficient understanding of computers and other issues to form critical opinions about them, as well as acquire and hone skills to recognize and evaluate their role in interacting with the Internet.

MIS 112: Computers and Internetworked Society (1 unit)
The MIS 112 class was added to the BSBA requirements in 2012. In this integrated lecture-lab course, students learn skills in Excel and the analytical methods used for business problem solving including analysis techniques and algorithmic design and implementation.

MIS 304: Using and Managing Information Systems (3 units)
Students learn ways that organizations improve their business practices through the use of computer technology. Topics include systems technologies, enterprise integration, business applications, and critical analysis of organizational change through information systems.

OSCM 373: Basic Operations Research (3 units)
Students learn ways that organizations efficiently create goods and/services. Topics include business processes, MRP, forecasting, facility planning and layout, inventory management, quality control and just-in-time manufacturing.

The Zipperman Scholars Program is an innovative program that reaches out to pre-business students. This program informs top pre-business students, no matter what major they may select, about the role that MIS plays in modern business. The Advanced Zipperman Associates Program is a newer initiative designed for students who are admitted to Eller and are majoring in MIS and either Accounting or Finance. Details of the programs are discussed below.

2. Eller College Online Undergraduate and Global Programs

The courses described in the previous section (MIS 111, MIS 112, MIS 304, OSCM 373) are offered in the online undergraduate program as well as the global programs. In addition, the major for the online and global campuses is BNAD, which includes one additional MIS course, MIS 478.

MIS 478: Project Management (3 units)

Students learn basic principles of project management that can be readily applied to their other classes, the whole MIS program, their work, and even their personal lives. The course takes students through a typical process of managing projects, including organizing, planning, and performing projects; and presents a scientific, systematic approach to project management.

3. Eller College Graduate Programs

MBA

In addition to its own graduate programs, MIS is a full participant in the Eller MBA portfolio of programs. MIS offers two required courses in the MBA programs:

OSCM 560: Operations Management (2 units)
This class is designed to give business leaders the tools they need to successfully understand, evaluate, and execute business operations. This course focuses on the theories, principles, and technologies that are common to the development of operations and supply chain strategies, tactical management of operations and supply chains, and the key concepts that must be understood by managers wanting to successfully manage and improve them.

MIS 585: Strategic Management of Information Systems (2 units)
This class is designed to expose business leaders to major themes in the field of management information systems and examine the transformative effect digital technology is having on business and society. Students also learn processes for designing and validating new digital products and services.

Eller MBA students have the option to choose among three MIS concentrations that will help advance their business degree.

Business Intelligence and Analytics (BIA) Concentration
MIS 545: Data Mining for Business Intelligence
MIS 584: Big Data Technologies
MIS 587: Business Intelligence

Security and Information Assurance (SIA) Concentration
MIS 515: Information Security in Public and Private Sectors
MIS 516: Information Security, Risk Management., Disaster Recovery
MIS 517: Systems Security Management

Managing Business Operations (MBO)
MIS 527: Introduction to Enterprise Computing Environments
MIS 578: Project Management
OSCM 577: Supply Chain and Logistics

Online MBA students also have the option to select the Privacy and Security concentration that includes:

MIS 515: Information Security in Public and Private Sectors
MIS 516: Information Security, Risk Management., Disaster Recovery
MIS 511: Social and Ethical Issues of the Internet.

A healthcare concentration is also offered, in which MIS has two courses:

MIS 506: Healthcare Information Systems

MIS 596: Special Topics Class: Health Analytics.

Dual Degrees
Both the MS MIS and the MSBA programs have dual degree offerings with MBA and other specialty master's programs in the Eller College. A special dual degree program, dubbed the Technology Leadership Program (TLP), was launched in 2018 to attract students interested in MIS who also want an MBA. The program requires tight coordination between MIS and MBA so that students receive the appropriate balance of courses to enable them to qualify for a technical internship after their first year. It has enabled both programs to recruit very high-quality applicants.

MHM
The department also participates in the online Master of Healthcare Management program. MIS offers a core course, MIS 506: Healthcare Information Technology (3 units). In addition, we offer a concentration in Healthcare Informatics, which includes MIS 561: Data Visualization, MIS 515: Information Security in Public and Private Sectors, and an MIS special topics class: Health Analytics. We hope to offer this concentration for online MBA as well.

Product Management
Finally, we are in the planning stages, with the Marketing Department, of a concentration/certificate in Product Management. Students in both the online and on campus programs are eager to obtain training in product management since many of our graduates ultimately take positions in the area.

4. Zipperman Scholars Program

The Zipperman Scholars Program, funded by a generous gift from Walt Zipperman, is designed to stimulate interest and create excitement about the MIS program and the role of MIS in organizations among top Eller students and to increase the number and quality of undergraduate MIS majors. It has also exposed major business organizations to our top students.

The strategies of this program include identifying high achieving freshman pre-business majors and inviting them to apply to the competitive Zipperman Scholars Program; exposing the Zipperman Scholars to what MIS is all about and the job opportunities in the field; providing the Zipperman Scholars with networking opportunities with faculty, peers, and organizations; and creating a buzz about the field of MIS among pre-business undergraduates that extends beyond the Zipperman Scholars themselves.
The benefits to the students for participating in this program include:

- A $100 scholarship for up to three semesters
- One unit of elective credit for each semester in the program
- Participation in real-world IT experiences
- Opportunities to engage in research projects
- Special gatherings with faculty and other distinguished Eller guests
- Opportunities to shadow executives and IT professionals
- Networking with business professionals, faculty, and students
- Opportunities for internships
- Preparation assistance for the admission process to the Eller College Professional Program
- A stronger resume

The benefits for MIS and the Eller College include:

- Many of the brightest students in Eller have received substantial exposure to the field of MIS (about 75% have chosen to major in MIS as either the first or second major).
- Increase in GPAs of students entering the MIS major.
- Closer relationships with such diverse organizations as Walmart, Raytheon Technologies, and the Phoenix Suns.
- Opportunities for summer internships in IT after the sophomore year.

5. Advanced Zipperman Associates (AZA) Program

The Advanced Zipperman Associates Program, funded by a generous gift from Walt Zipperman, builds on the Zipperman Scholars Program by offering an advanced two-year track focused on professional preparation for careers in tech consulting. The program has space for up to 40 Zipperman Scholars with double majors in MIS and Accounting or Finance during their junior and senior years at Eller. The program offers opportunities for extracurricular skills development, internship placement support, networking opportunities, and a $1000 a year scholarship.

6. Chen Chow Bear Down Scholars Program

The Chen-Chow Bear Down Scholars Program, funded by a generous gift from Drs. Hsinchun Chen and Sherry Chow, is designed to stimulate interest and create excitement about business in general and the MIS program more specifically among Native American Eller students. The program was launched in spring of 2021 and offers a renewable scholarship, as well as opportunities for scholarship recipients to engage in activities designed to help them be successful at Eller and to increase their understanding of what MIS is and what a job in MIS might look like. As part of this program, a University of Arizona chapter of the American Indigenous Business Leaders (AIBL) was established in spring of 2022. In summer of 2022, two of the founding members of the AIBL, also Chen-Chow Scholars, were funded to attend the national meeting of AIBL in Palm Springs, California. Participation in AIBL is open to the entire University of Arizona community. The goal of this program is to attract more Indigenous students to Eller and MIS, and ultimately to encourage them to pursue advanced degrees.

7. AZSecure Scholarship for Service

Funded by a grant from the National Science Foundation, the program has produced over 20 graduates at both the masters and doctoral level. The program is aimed at increasing the number of highly qualified cybersecurity specialists. The grant provides funding for scholarships, stipends, and travel support. The University of Arizona's program encourages students to be actively engaged in cybersecurity research and publication as well as the larger cybersecurity community through direct involvement in professional activities and events. The program was initially funded in 2014 and renewed in 2020. Led by Dr. Hsinchun Chen of the MIS Department, the program includes faculty and courses from Engineering and Computer Science.

8. MS Cybersecurity

The online MS Cybersecurity program is a joint endeavor among MIS, Systems and Industrial Engineering, and Electrical and Computer Engineering in the College of Engineering. MIS and Engineering each offer two of the four core courses in the program. Students are allowed to choose either an Information Systems or a Physical Systems track within the program. MIS manages the requirements for the information systems track, while Engineering manages the requirements for the physical systems track. Admissions and advising for the program are conducted by MIS. Approximately 80% of the students in the program choose the Information Systems track, while 20% choose Physical Systems.

9. Certificate of Academic Excellence – Cyber Research

In 2017, MIS coordinated campus efforts to earn a Certificate of Academic Excellence in Cyber Research (CAE-R) designation for the University of Arizona. The certificate is recognition that there are faculty engaging in cybersecurity research, there is significant cybersecurity research being conducted at the university, and doctoral students are being trained in and able to specialize in cybersecurity. We are in the process of renewing the CAE-R and will once again be surveying the campus regarding doctoral programs and research in cybersecurity.

10. General Education Courses

As a service to the University, Patti Ota and Brandon Marshall have been offering two general education courses in small sections:

MIS 150A: Decision Making and Problem Solving for Daily Life
General Education: Tier 1 Individuals & Societies
The purpose of Problem Solving in Daily Life is to investigate the factors affecting problem solving and decision making in daily life: how to be better prepared to tackle academic and non-academic problems, how to identify creative solutions, and how to make higher quality decisions. This course helps students put their analytical, creative, and practical thinking skills together to identify and analyze a situation, generate possibilities, choose one, follow through on it, and evaluate its success. This course has been adopted by the Eller College as a Course-In-Common for freshman pre-business Arizona Assurance students. About 75 students enroll in this class each year.

MIS 150B: Interpersonal Relationships in a Changing World
General Education: Tier 1 Individuals & Societies
The purpose of Interpersonal Relationships in a Changing World is to understand how the communication process operates – verbally and non-verbally, individually and in groups, and how communication affects personal and cultural concepts of who we are. This course includes understanding of stigma and prejudice, and they relate to racial bias, gender differences, sexual orientation, variance of abilities, and cultural identities. This course tries to explore all sides of every issue and encourages students to think critically, to have a willingness to take risks, and a tolerance towards ambiguity and viewpoints different from their own. This course has been adopted by the Eller College as a Course-In-Common for freshman pre-business students accepted into the Eller Elite Program. About 150 students enroll in this class each year.

While MIS 150A is still under review, MIS 150B is currently going through the approval process for inclusion in the new General Education program.

11. Collaborative Research Initiatives

Collaborating with other university units on research has been part of the MIS Department's tradition for many years. Projects currently underway or recently finished include:

Audio Generation and Optimization from Existing Resources for Patient Education. This project involves faculty from MIS (Leroy), Psychology (Stone), and Communication (Rains). It focuses on improving health literacy and the role that audio can play in doing so. There is a steady and substantial increase in the use of virtual assistants and smart speakers for information retrieval including information related to healthcare and medicine. However, few (if any) tools exist to improve content and generate optimal

audio. This project aims to discover supportive and adverse features of audio/text information provision and create a free, online software tool for optimizing health-related text.

Health Information Technology to Support Autism Spectrum Disorders (ASD) Risk Assessment for Early Diagnosis. This project involves faculty from MIS (Leroy), Pediatrics (Andrews, Rice, Galindo), and the School of Information (Burleson). It is focused on enabling early diagnosis of Autism spectrum disorder (ASD), a developmental disorder that affects 1 in 59 children in the US and is associated with significant social-communication and behavioral impairment. Early diagnosis is crucial since it allows for early treatment and the best long-term outcome. However, early diagnosis is challenging in rural settings where there are few medical and behavioral specialists. To address this problem, this 4-year project is designed to develop health information technology to support clinicians, who may have limited ASD expertise. Two HIT components will be independently developed using both structured and unstructured data from electronic health records (EHR): a case classifier and a criteria extractor. Both will be combined as one HIT solution and provide ASD diagnostic support. The HIT will be evaluated for its ability to support the diagnostic process by residents and pediatricians to address the difference in expertise between experienced clinicians and individuals new to the clinical setting.

Learning to Hash Information Networks. A joint endeavor between MIS (Ge) and SIE (Cheng), this project proposes to develop a suite of solutions for learning to hash information networks. Most existing network embedding methods represent nodes with dense and continuous vectors in low-dimensional Euclidean space. Network analysis tasks such as node retrieval and recommendation and link prediction still suffer from computational challenge, especially while responding to real-time requests. We will not only develop sophisticated network hashing methods for modeling both structure and attribute information of information networks, but also study advanced optimization solutions for solving the formulated machine learning problems.

A Data Science Platform and Mechanisms for Its Sustainability. This project is a collaboration between MIS (Ram) and the School of Natural Resources and Environment (Hoffman). Using natural language process and data science, this research will design and develop a data science platform that provides access to policy documents. The platform will make analytical tools available for the first time—using natural language computer processing and data science—to enable systematic research and inquiry by practitioners, project proponents, scholars, and the public. In turn this will help stakeholders answer a host of critical questions about public policy.

cyberSW: A Data Synthesis and Knowledge Discovery System for Long-term Interdisciplinary Research on Southwest Social Change. A collaboration between MIS (Ram) and Anthropology (Mills), this project addresses a major obstacle to using longitudinal archaeological data to understand fundamental changes in human history. Specifically, much of the data collected by archaeologists is not digitally archived or synthesized beyond individual projects. This project takes an important step toward realizing the research potential of digitization efforts by ratcheting up the availability of large-scale archaeological datasets to both researchers and the public by (1) merging several existing synthetic databases from the U.S. Southwest into one scalable, networked database; (2) collecting additional data from archives, reports, museum collections, and limited fieldwork to fill in spatial, temporal, and material culture gaps in the new database; (3) analyzing those data and creating user-friendly online tools for data analysis and display based in network science and other quantitative methods; and (4) establishing a web portal for data display, analysis, and sharing that is accessible to multiple levels of users.

Scholarship for Service. The NSF-funded grant mentioned above focuses on education, but also includes a significant research component, as all students in the program are required to engage in at least one

research project. Although Engineering and Computer Science are the official grant partners, faculty from any relevant unit on campus participates in these research projects.

In addition to these funded projects, our faculty have partnered with other faculty from the College of Medicine, the School of Information, and the Math department (to name a few) on grant submissions that are currently pending. One of our assistant professors, Taqi Raza, has recently joined the research network for Secure Quantum Key Distribution. The MIS Department has positioned itself as an important partner on campus, with a focus in the areas of *Big Data Analytics and Informatics* and *Cybersecurity*. MIS is also well-positioned for collaboration with other university units, with Health Informatics and Innovation as specific topic areas.

L. FACULTY PLANNING

1. Faculty Collective View

MIS faculty members were surveyed to understand their overall beliefs regarding the department and its future (questions are in the appendix). With just over 85% of the faculty responding, a few key themes emerged:

1. The department is moving in the right direction
2. The department is collegial and provides support for research and teaching
3. Financial resources are insufficient
4. More faculty are needed

Some themes are the same as in our last review. Overall, the sentiment is more positive than in our last review. In terms of the department's direction, 90% of the respondents feel the department is moving in the right direction and 100% feel that the department's research productivity compares favorably to that of our peers. However, only 70% feel that the department has what it needs to achieve its objectives, with specific areas of concern around the size of the staff and the incentives at the college.

In terms of financial resources, only 50% of the respondents feel that the department has sufficient financial resources to achieve its goals. The same percentage feels that the salaries in the department are competitive. About 55% feel that the department has enough faculty to achieve its goals. This sentiment about faculty and resources is echoed in the open-ended comments.

> "We are short handed; we lose key people and have not replaced them; at the same time we continue to expand into other areas. There is a need for the College to not only increase base salary, but there is a strong need for summer money for full professors who are productive."
>
> "The department is understaffed, we are short faculty (faculty have left and not been replaced), and resources do not flow to the department in correlation with our volume of activity (and contribution to the bottom line). We continue to do more but we have not added any capacity so faculty are handling a lot of the growth with overload teaching which has a negative impact on research. Staff are also struggling with increased work load and no correlated increase in staffing."

2. Planning and Incentives

Throughout the years the department has been able to preserve its reputation, rankings, and visibility as a top 5 department, due to the work of its outstanding faculty. Because of what we do in research and teaching, the department is better positioned than most similar departments in the country to lead in the new era of big data analytics, informatics, and cybersecurity. We have built the research expertise to generate impactful research contributions, and a comprehensive and flexible platform for the delivery of educational services. We have the experience and the knowledge to deliver our services in an increasingly global and interconnected world.

As the survey results indicate, the faculty believe we are moving in the right direction to continue to be successful. However, we have accomplished a lot in times of dwindling resources: increased by 60% the number sections we teach at both undergraduate and graduate levels, continued to excel in securing top

grants, have performed at the highest level with service to the community, developed a highly respected cybersecurity program, and continued to upgrade the curriculum and our offerings.

In the last review, we indicated a need to hire 6 additional tenure track faculty and 3 additional lecturers. In the decade since that review, the department has one fewer tenure track faculty member and two additional lecturers. After carefully reviewing teaching needs and capacity, we believe that five additional tenure-track faculty members are needed. One of these positions should be a senior associate or a full professor to enable better succession planning in the department. The remaining four should be junior faculty. We also need two additional career track faculty to assist with the growth in the undergraduate online BSBA program, offer courses for the new undergraduate business analytics program, and help to reduce the amount of overload teaching. In section E, we presented the analysis backing our immediate teaching needs. We reproduce table E6 here.

Table E6: Faculty required in short run to address faculty needs

Identified teaching need by tenure track faculty	No. tenure track faculty	No. lecturers
Replacement for Bin Zhang (left in 2021)	1	
Replacement for Junming Yin (left in 2021)	1	
Replacement for Lusi Yang (left in 2022)	1	
Capacity expansion in MS programs/reduction in overload teaching	1	
Undergraduate business analytics major	1	
New initiatives (undergraduate analytics, certificates, reduction in overload teaching)		2
Total	**5**	**2**

To support our faculty in performing highly and to increase retention, we need to address disparities with respect to our peers. Thus, we need to continue improving our incentives to retain the faculty we have. We have covered some of these needs in Section G:

- We need to continue to be vigilant in terms of benchmarking our salaries based on AACSB numbers, as well as comparisons with our top 5 peer schools. This is essential in order to be competitive as a top 5 department. In addition, the University needs to continue supporting raises on an annual basis, consistent with our peers.

- Guaranteed summer research support to productive research faculty throughout their careers. This has become common practice among our peer institutions. Currently, the support is available for the first three years. Competitive summer support is available for assistant and associate professors, but full professors are not allowed to compete for these funds.

- Access to PhD students. The department needs to build a pool of PhD students that are not funded directly by grants through the research labs, so that (especially) junior faculty could have access to develop research relationships with them. That effort was started at the time of the prior review but has been sporadic due to the limited number of qualified applicants and the need to provide funding for students who rotate off grants.

- Additional research and travel funding. With inflation and an increasing number of relevant conferences in the discipline, $6,000 is rather low for travel funding. Our premier conference is

outside of the US two out of every three years, which increases travel costs. In addition, conference registrations are rising as are the costs of professional memberships.

- Obtain endowed chairs for our top research faculty.

The department is committed to working with College and University leadership to achieve these goals.

APPENDICES