

**UMBC Department of Information Systems
Academic Program Review
Report of External Visit**

5/8/18

Executive summary: On May 7-8, a Visiting Review Team (VRT) of Thomas Finholt (Dean, School of Information, University of Michigan) and Marios Papaefthymiou (Dean, Donald Bren School of Information and Computer Sciences, University of California, Irvine) conducted a review of the Department of Information Systems at the University of Maryland, Baltimore County. The review consisted of a reading of reports provided by the department leadership, interviews with department, college, and university leaders, and group interviews with students, staff, and faculty. The VRT also toured the department's facilities. As a result of the review, the VRT concluded that the Department of Information Systems is a thriving and successful enterprise, with an effective instructional program serving a large number of UMBC undergraduate and graduate students, and an ambitious portfolio of faculty-led research that is receiving external recognition--particularly in the form of competitive grants. Despite the overall success, there are some areas that require additional investment and attention if the Department of Information Systems is to meet all of their long-term strategic goals (e.g., increased enrollment, greater sponsored research expenditures). Therefore, we recommend the following:

- a) UMBC should address the growing faculty workload imbalance -- indicated mainly by the increasing student-to-faculty ratio -- through the allocation of additional tenure-track lines to the department;
- b) UMBC should address the paucity of senior faculty leadership -- and consequent deficits in terms of mentoring for junior and mid-career faculty -- by offering mentoring support in the form of programmatic assistance (e.g., leadership training), hiring more full professors, and accelerating the promotion of long-time associate professors to the rank of full professor;
- c) UMBC should address deficiencies in the quality and consistency of instruction, particularly in the Health Information Technology degree program, by reducing dependence on adjunct faculty and hiring more permanent faculty (e.g., lecturers);
- d) UMBC should address outdated lab furnishings and equipment by replacing obsolete computers and installing new chairs and tables -- particularly in the public labs that are used heavily by undergraduates;
- e) UMBC should further consider the question of creating an independent School of Information or College of Computing in the context of its growth strategy for the campus and the College of Engineering and Information Technology.

Background: The Visiting Review Team (VRT) was on campus at UMBC on May 7 and 8, 2018. In preparation for the visit, the team read the self-review report submitted by the Department of Information Systems and read the guiding questions for the Academic Program Review provided by the UMBC Provost. While on campus, the visiting team met first for an orientation dinner with department, college, and university leaders. The next day, the visiting team met with the Vice Provost for Academic Affairs, the Dean of the College of Engineering and Information Technology, and the Chair of the IS Department; it then held a series of group meetings with undergraduate students, graduate students, staff, and faculty. The group meetings consisted of the visiting team and the various informants; department and/or college leadership was not present for these meetings. The visiting team encouraged the informants to be frank, but reminded them that comments were being solicited as input to their administration. All of the informants were forthcoming and shared their thoughts freely. There was no evidence that information was withheld -- and therefore, comments from the informants provided a reasonable basis for assessment.

Workload: As of AY 2017-18, the IS Department has 26 tenure-track faculty and 7 full-time lecturers. To fulfill its teaching mission, the department relies on 12 state-funded teaching assistants, 7 teaching assistants funded by the online MS program in Information Systems, and 45 adjunct faculty. As of Fall 2017, department enrollment is approximately 1250 undergraduate students and approximately 450 graduate students (75 pursuing a PhD).

The undergraduate-to-graduate student ratio of 3 indicates that the department's commitment to undergraduate education is combined with an unusually strong commitment to graduate and professional student development. (In most computer/information science programs in the nation, this ratio ranges between 4 and 5.) Furthermore, the PhD-to-faculty ratio of 3 is in line with R1 ratios in information science programs, pointing to an impressive ramping up of PhD research efforts over the past decade. The student-to-faculty ratio of 65 exceeds that of most R1 computer/information science programs in the nation, and the undergraduate-to-faculty ratio of 50 is on the high end among R1 programs in information science. The undergraduate-to-TA ratio of 100 is at least twice as high as in most computer science programs in the nation. Teaching workload is therefore considered heavy in comparison with research-oriented programs in the nation. Moreover, teaching assistant support is relatively low for the size of the program.

The issue of high teaching workloads was raised by faculty during interviews. (At the same time, the faculty acknowledged that the department is very collegial and provides a supportive environment for assistant professors, shielding them as much as possible from teaching pressures.) It was also acknowledged in VRT's discussions with College and Campus administration. The department is relying on an unusually high number of adjunct faculty to maintain a relatively low number of students per lecture section (typically in the 50 to 75 range, compared to 100+ in R1s). Nevertheless, the high number of adjunct faculty appears to lead to significant logistical and quality control challenges.

The VRT feels that to maintain its current trajectory (let alone to grow its enrollments and graduate programs further), the IS Department requires additional faculty and instructional support resources. The Department faculty are mounting a Herculean effort to excel in both teaching (the traditional mission of the campus as recently as a decade ago) and research (a dimension that has been emphasized for about a decade now), and current workloads are viewed as unsustainable. Moreover, teaching loads for research-active faculty (3 to 4 semester courses per year) are incongruent with those in research universities (2 semester courses per year).

Since the last external review, the department has hired several research-active assistant professors in areas of high relevance for the area and the nation (big data, cybersecurity, health). The VRT feels that the department is in a good position to continue hiring successfully in areas of high research relevance and in alignment with the strategic priorities of the Campus.

Faculty mentorship: The current composition of the Department is heavily skewed toward junior and mid-career faculty. Both department leaders and faculty commented frequently on the shortage of full professors -- a condition exacerbated by upcoming retirements and departures. In fact, relative to the 26 tenure-track faculty currently in the department, there will soon be only two full professors (one is the chair, the other is on the cusp of retirement). This situation leaves junior and mid-career faculty at a significant disadvantage. Evidence gathered by the VRT suggests the form and depth of this disadvantage. First, mid-career faculty lack guidance on steps they should complete to be promoted to full professor. For example, several mid-career faculty reported confusion on the criteria that would be applied. By contrast, department leadership was specific that cases for full professor must meet very high standards -- including success in obtaining external research awards. If it is the case that UMBC has high standards for promotion to full professor, these expectations must be communicated successfully to mid-career faculty in the department -- and the department must provide a scaffold for mid-career faculty to meet these standards. Greater availability to mentoring from senior faculty would be an important part of this process. Second, given the recent emphasis on external funding in the department, junior faculty need more help in obtaining research grants. The VRT heard several stories of junior faculty engaging in furious grant submission activity -- perhaps in the belief that more submissions would increase the probability of success. In fact, the exact opposite seems likely. That is, the effort to prepare multiple submissions probably results in all submissions being sub-par, in contrast to a strategy where faculty hone one or two proposals to a higher degree of development. Better yet would be a super-structure of senior faculty-led proposal efforts that could include junior faculty and therefore let them evolve skills in grant writing -- while also providing external support through shared projects with senior colleagues. Finally, through the absence of senior faculty, junior and mid-career faculty are thrust into leadership roles (e.g., directing degree programs) before their time. While faculty in these roles are succeeding, it is through a much higher than normal reliance on trial-and-error learning. In many programs a more typical model would be learning based on the experience and counseling of senior faculty (preceded by holding a junior leadership role, such as associate chair of an academic program committee).

Health informatics degree: The Department has recently launched a new Master of Professional Studies (MPS) program in Health Information Technology in collaboration with the Division of Professional Studies (DPS). As of Fall 2017, the program has 52 students enrolled and 30 students graduated. Although the VRT did not conduct a deep dive into this program (we understand that it is too early for the program to be reviewed), it did discuss aspects of the program, given its high relevance and potential for growth. The VRT felt that enrollment levels in the program were unexpectedly low, possibly due to lack of sufficient marketing support. Also, the VRT noted that the program is taught almost exclusively by adjunct faculty. The VRT understands that the Campus serves as a repository for all Medicaid payments in the State of Maryland (The Hilltop Institute). Integrating this data into aspects/courses of the program would add a highly-valuable element to the program and could be supported through external funding sources.

Formation of a separate college: The VRT was asked by the Department to comment specifically on the wisdom of forming a separate School of Information or College of Computing. From evidence provided to the VRT, there is significant overlap in the instructional and research missions of the Department of Information Systems and the Department of Computer Science and Electrical Engineering (CSEE). Indeed, alignment seems to be accelerating. Specifically, in the founding of the Department, many faculty came out of the information management systems tradition, with a greater emphasis on users of information and systems -- in organizational contexts -- and less emphasis on the design and performance of underlying technology. In recent years, this orientation has diminished within the department. The UMBC strategic alignment around data science is playing some part in the changing direction and composition of the department (e.g., a recent faculty hire is a data science person). Changes are reflected in other hiring that is specific to AI and machine learning (areas where faculty are also having success in obtaining external funding, such as NSF CAREER awards). While faculty did articulate differentiation between the department and CSEE, notably an assertion that the department has a more applied approach -- this was often accompanied by observations that CSEE is also adopting a more applied approach. The increasing alignment between the department and CSEE suggests that formation of a School of Information -- presumably encompassing mostly the current department -- would not be the right move. This leaves the question of whether a College of Computing (such as at Georgia Tech or Carnegie Mellon) would be the right direction. In an administrative system with activity-based budgeting, the formation of a separate college would have advantages. Notably, the college and the faculty could more directly benefit from revenue flowing from instructional activity, and presumably have more say in the allocation of revenue to address consequences of increased enrollment. However, UMBC is not activity-based, and therefore it is less clear whether there is any financial advantage in separating CSEE and IS from their current home in the College of Engineering and Information Technology. Independent from financial concerns (which are considerable), there may be other reasons to consider formation of a separate school. For example, IS is a somewhat peculiar fit to the college. In many universities, information systems is housed within a business school. Also, to the extent that the college wishes to establish visibility around core engineering disciplines, computer science and information systems may

not contribute much to this effort -- and therefore may face a struggle in arguing for resources against growing enrollment and other pressures.

Facilities: The Department is fortunate to occupy a relatively new building (15 years old) and to have quite a bit of space (at least adequate for current needs). However, the public computer labs are in need of a significant makeover. The current configuration consists of enclosed rooms with tables and desktop computers arranged either in rows or around the walls. The computers installed in these labs are obsolete. The monitors are too small and the CPUs are several years old. A normal replacement cycle would be 24 to 36 months. These machines were 4 to 6 years old. Further, the logic of the room layout is not consistent with the norm in modern workplaces, where work areas are more likely to be organized in clusters with moveable furniture and a mixture of group and individual work zones. Aesthetically, the labs are dreary and unwelcoming. This is in stark contrast to the design of workplaces in Silicon Valley, for example, where there are bold design elements often achieved with relatively inexpensive materials (e.g., paint and plywood, as in Facebook's Building 20). The re-design of these labs would be an excellent opportunity to engage the Department's student body, such as in a design competition.

Provost questions: The following responses are organized according to the numbering scheme in the supplemental materials provided by the Office of the Provost ("Questions to be addressed in Report of External Visit"):

- a) The general goals and specific objectives of the Department are appropriate and are being met, subject to the constraints and challenges noted in detail above.
- b) The two undergraduate leaders and six doctoral students who met with the VRT reported overall satisfaction with the quality of instruction and faculty mentorship.
- c) Proposed directions of growth are consistent with UMBC strategic plans. However, realizing these ambitions may be compromised if the challenges outlined above are not addressed. Relative to aspirational peers, the department is currently doing well, but at some expense in terms of faculty workload and morale. The present model is probably not sustainable.
- d) The curriculum is of high quality and notable in some ways, such as the relatively small size of class sections. An area of improvement could be the introduction of a mandatory capstone experience in the undergrad curriculum where students could engage with external sponsors to demonstrate mastery of skills learned at UMBC.
- e) The faculty seems acutely sensitive to closing the loop in terms of learning objectives and assessment. This was a very detailed component of the departmental self-review, showing a much greater attention to these issues than is typical.
- f) The facilities are currently adequate -- with the exception of the public computing labs as noted in detail above.
- g) The level of scholarly output is as expected, and indeed impressive given other demands on faculty time and attention (see the workload discussion above).
- h) Resources are being used effectively, but are currently inadequate relative to demand (particularly in the face of excessive faculty workload).

- i) There are notable opportunities for collaboration with other units, and some of these are occurring (such as with the medical school at the University of Maryland, Baltimore). However, there are other opportunities that seem unrealized -- notably the use of The Hilltop Institute data.
- j) The specific challenges called out above -- and summarized below in the conclusions -- specify the areas of greatest concern.

Department questions: The following responses are organized according to the numbering scheme in the supplemental materials provided by the Office of the Provost ("Questions to be addressed in Report of External Visit"):

- a) The issue of forming a separate school is addressed above and in the conclusions below.
- b) The price point of laptops suggest they are nearly ubiquitous. That is, independent of any requirement to own one -- most incoming students already do. However, this may be subject to financial means, such that even given low cost, a laptop may still be a luxury for some students. In these cases, there should be support, in the form of discounts available through campus purchasing plans and/or loaner machines available to enrolled students.
- c) The magnitude of available grant funding in information and computer science is not sufficient to rely on this as a main source of increased revenue to address needs in faculty hiring. Therefore, increased funding should be pursued as a product of faculty obtaining adequate support to fund their research projects -- but not as a solution to provide resources to meet other needs, such as increasing enrollment.
- d) The lack of senior faculty is addressed in detail above and below in the conclusions. The nature of the Health Information Technology degree and the overall trend toward reliance on adjunct faculty is also addressed.
- e) The faculty commented consistently that the lack of a five-year support package for prospective doctoral students was a major barrier to recruiting. This is probably true, but may not be the main problem in recruiting, where other factors, such as institutional reputation, also play a large role.
- f) Peer comparisons are difficult -- because few institutions attempt to combine instructional excellence with research intensity as UMBC aspires to do. The Department compares favorably with the lower tier of so-called "iCaucus" institutions (i.e., the subset of information schools in the iSchool organization distinguished by a set of criteria, including minimum research expenditure of \$3M annually, headed by a dean reporting to provost, and paying the highest dues to the iSchool organization -- \$5000 per year). Both Michigan and UC Irvine would be among the top iCaucus universities. UMBC is on par or superior to Drexel, North Texas, Florida State (in the US), Humboldt and the University of Copenhagen (in Europe), and Wuhan University (China). Among the so-called "Tier 2" institutions in the iSchool organization, UMBC is superior to most of the US schools, including the University of Wisconsin at Milwaukee, Indiana University-Purdue University Indianapolis, the University of Kentucky, the University of Tennessee and the University of Missouri.

Conclusion and recommendations: This report has focused in five critical areas:

- a) Workload;
- b) Faculty mentorship;
- c) Health Information Technology degree;
- d) Facilities; and
- e) Formation of a separate School of Information or College of Computing.

Workload. The department's workload is high by any metric. Nevertheless, the department is on a very positive trajectory, hiring research-active junior faculty and growing its research activities in areas of regional and national relevance (data science, cybersecurity, health). The VRT feels that to maintain its current trajectory, the IS Department will require additional faculty and instructional support resources. Based on strictly quantitative metrics, the Campus should be planning for 40% faculty growth, bringing teaching loads to a sustainable 2 semester courses per year for research-active faculty, and 100% instructional assistance growth in the next 5 to 10 years. Faculty growth will be accompanied by research growth, a desirable outcome, and decreased reliance on adjunct faculty, which is expected to further increase quality of instruction, a point of pride for the campus. In the VRT's view, the department has demonstrated its ability to hire in areas of research relevance and in line with the strategic priorities of the campus for research growth and interdisciplinary research.

Faculty mentorship. The department has a severe shortage of senior faculty relative to the number of junior and mid-career faculty. This shortage deprives junior and mid-career faculty of critical mentoring while prematurely pushing them into leadership roles. There are three steps UMBC can take to address this shortage:

- a) Make it a priority to hire senior faculty from outside UMBC;
- b) Institute formal mentoring programs, such as leadership training, to fill gaps left by the absence of senior faculty (Note: Such programs should be mounted even if more senior faculty can be hired or created.); and
- c) Make it a priority to get long-serving associate professors promoted to full -- this may involve one-time incentives (e.g., sabbaticals) to allow these faculty to take on and complete projects that will strengthen their portfolio to meet UMBC expectations for promotion.

Health Information Technology degree. This degree is highly relevant and has the potential to become a signature professional program for the department. The VRT feels that enrollments in this program can increase through a more extensive and targeted marketing effort. It also feels that the program will benefit if IS faculty assume a more central role as program instructors. The on-campus repository of Medicaid data for the State of Maryland represents an invaluable opportunity for differentiation and external funding through its integration in the program.

Facilities. Overall, the department's facilities are adequate for current needs -- with one glaring exception. The public computer labs are unwelcoming and have obsolete equipment. There are three steps UMBC can take to address this situation:

- a) Upgrade the computing equipment, including modern CPUs and large monitors;
- b) Upgrade the lab furniture -- specifically allowing more flexibility in the configuration of the rooms, such as a wider array of potential work zones spanning individual to group work; and
- c) Conduct a student design competition to enhance the appearance of the labs, where the scope could include design elements (wall color, decorations) as well as capabilities (e.g., technology in the labs).

Formation of a separate school. Based on evidence presented to the VRT, the Department of Information Systems and the Department of Computer Science and Electrical Engineering are more aligned today than at any point in the past -- and this alignment appears likely to increase. Both departments face similar challenge, such as rising enrollments. While there does not appear to be a compelling reason to form a separate school based on these two departments, and there was no case made for this among the faculty and student informants, there are unique issues faced by the departments that UMBC must address and that could be through the formation of a separate school. Specifically, in a college with an engineering emphasis, feeding that vision might not be consistent with the best interest of either IS or CSEE.