Ohio | Board of Regents

John R. Kasich, Governor
Jim Petro, Chancellor

University System of Ohio

Request for Approval

Submitted by

Kent State University

Establishment of a Master of Science in Business Analytics (MSBA)

Appendix E: Response to Comments from PDP Review

Date: _____

KENT STATE UNIVERSITY

Introduction

A request for feedback from RACGS Institutions on the Program Development Plan (PDP) associated with the proposal from Kent State University – College of Business Administration for a Master of Science in Business Analytics (MSBA) program was submitted on October 21, 2014.

This document contains every feedback response we received in the order that we received them (which may or may not be the order in which they were submitted). Our responses, including discussions of any necessary changes to the proposal, are integrated into the feedback. RACGS feedback is shown in italics and is quoted, KSU's responses are non-italicized bold, and specific changes to the proposal in the response are underlined. Feedback text is not edited and is displayed as received. Font and formatting may have been modified for in-document consistency. All feedback was received between November 5, 2014 and December 8, 2014.

We thank all RACGS institutions for their valuable feedback. This process and the quality of feedback have undoubtedly resulted in a significantly improved proposal.

Document Font Legend

"RACGS Institution Feedback…"

KSU Response…

<u>Specific changes to full proposal…</u>

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Wright State University

"Feedback on PDP for MS in Business Analytics at Kent State University

1. Market need for the proposed program and the distinctions or differences between the proposed program and other similar programs across the state;

The proposal has presented good evidence from multiple sources to support the need for such program."

Thank you for the positive feedback. The full proposal does contain some additional support in this area.

"2. Opportunities for collaboration with the RACGS member's own institution;

Wright State University is located in the opposite corner from KSU in the state. Since the proposed program is face-to-face, collaboration over distance might be challenging."

You are right that as face-to-face program collaboration over geographical areas would be challenging. However, over time and with program maturity there could be opportunities for online and blended learning deliveries that would engender collaboration.

"3. Concerns with substantive elements of the proposed degree program; and

The proposal should make it clear that the program is face-to-face, not online or hybrid. Is the program cohort-based where all courses are taken in sequence? The 30 credit hour, 10 course program is designed to be delivered within 1 academic year, which seems to be very aggressive. For masters level program, can students succeed with 5 courses taken at the same time? What are the models of course schedules of some current master students in other departments or at KSU?"

Indeed, the program is designed as face-to-face, and not online or hybrid. But, in light of the ever-increasing demand for online and blended learning education, the program could be upgraded to any of these delivery modes in the future. We have corrected this omission in the full proposal (Section '1.2.4 Course Delivery & Schedule Options' was added). The program is not cohort-based and the courses could be taken in any order if their prerequisites are met. The normal time to completion for the 30 credit-hour, 10-course program is one academic year, plus summer, with a course load of 4 for each academic semester and 2 for the summer term. However, the curriculum is designed to be flexible enough to offer exceptional and experienced students the opportunity to complete the program within one academic year. Similar 15-credit hours per semester programs are available at the Carlson School of Management (University of Minnesota), Lindner College of Business (University of Cincinnati), and the Carey School of Business (Arizona State University), to name a few. At Kent State University, the Master of Science in Chemical Physics is also designed with this flexibility.

"On page 4, the PhD Project seems a little confusing to me. If the purpose of this project is to attract faculty, how does it relate to the enrollment of students?"

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We are sorry for this confusion regarding the PhD Project and have provided more explanation for the program in Sections 3 of the full proposal. The PhD Project is designed to encourage and attract minority students into doctoral programs in business who upon graduation may become business professors. A good number of these students become affiliated with the program as undergraduates. Thus, it provides fertile grounds for recruiting minority students into graduate programs in business. Every year hundreds of minority students attend PhD Project sponsored events and conferences that KSU attends in an effort to recruit this group of students into its graduate programs.

We have expanded the discussion of the PhD Project in Sections 3 of the full proposal.

"Does the college have any big data lab or similar facility for the program? How and where should you plan to deliver the hands-on education in areas such as database management and big data?"

The college does not as yet have a lab dedicated to Big Data. However, the college has several computer labs where analytics related software and data would be installed for students in the program to access. Also, given the ubiquitous nature of laptop computers and other smart devices, some of these software and data would be installed in student-owned devices to the extent allowed by our leasing agreements with the vendors and the capacity of the student-owned devices. Plus, on approval of the proposed MSBA program the college plans on repurposing an existing lab if necessary. Thus, the hands-on education components of the program would be delivered both at the labs and classroom as necessary.

The M&IS Department has been successfully delivering hands-on education in the area of databases for some time. We have a departmentally-managed server with Oracle 12C Enterprise Edition (the most current version) installed on Windows 2012 Datacenter Server OS. Students work on Oracle with client software (such as Oracle SQL Developer – available free from Oracle) on their own computers or our lab computers. SAP is hosted by the SAP University Alliance at the University of Wisconsin – Milwaukee. We need not host or manage any of the SAP server software since as a member of the alliance, full access is granted to our instructors and students through SAP's client software. SAP software does have big data capabilities[1] and Sam's Club database, as well as other big data sources, is available through SAP. As we have discussed in the proposal we will avoid learning concepts exclusively (or even primarily) in SAP or other proprietary environments. Direct non-SAP Hadoop access and training will be delivered either through a hosted solution such as Cloudera[2] or our own Hadoop cluster installation. Currently a single-node cluster Hadoop instance has been installed and tested. Expanding this into a multi-node cluster may be required if a hosted solution is not chosen. A hosted solution is preferred so that local resources do not have to be used to manage the cluster. The college and university have more than

[1] Nerney, C. "SAP Updates University Alliances Program to Include Big Data Analytics." *Data Informed*. January 29, 2013. http://data-informed.com/saps-updates-university-alliances-program-to-include-big-data-analytics/. Retrieved January 15, 2015.
[2] Cloudera. "Cloudera Academic Partnership." http://www.cloudera.com/content/cloudera/en/developers/home/academic-partnership.html. Retrieved December 28, 2014.

adequate computer labs and network infrastructure to allow students to interact with these technologies from any on-campus computer and from anywhere with an Internet connection using a VPN (virtual private network) connection.

We have added Section '1.2.7 Program and Course Technologies' to discuss students' access to important technologies.

"On page 10, the curriculum presents a combination of 25% IDM, 50% DA, and 25% DML. What courses belong to which category? For instance, what courses are considered the DA courses? I don't seem to find the topics of statistical methods and forecasting mentioned in the courses listed on page 10."

Due to the holistic philosophy of the curriculum (discussed in the proposal) we do not describe any of the courses to be solely in one focus or another. The breakdown of each required course is also listed at the end of each course description. Courses may be more focused on one part of the program than the others but each course should address each of the three foci. For instance, Data Analysis (DA) dominated courses generally have 10% IDM, 80% DA, and 10% DML.

Statistical methods are dispersed throughout the curriculum in the Business Analytics course, most of the Data Analysis oriented courses, especially Data Mining and Advanced Data Mining and Predictive Analytics courses. Forecasting is related to predictive analytics, though predictive analytics has a slightly different focus than traditional forecasting. Traditional forecasting will be compared to predictive analytics in this course but the focus will be on predictive analytics and predicting trends and behaviors rather than focusing on predicting future events such as sales and inventory levels. Traditional forecasting is also a mature field with well-established sets of techniques that most organizations already have substantial capabilities in.

The course description for Advanced Data Mining and Predictive Analytics has been modified (Section 1.2.1) as the original implied a heavier emphasis on machine learning rather than the mix of statistical and machine learning techniques intended.

"On the last page, the plan of using one instructor to teach 4 courses concerns me. There are 8 core courses and half will be taught by one instructor? I'm afraid this will harm the value of the program."

We apologize that we misrepresented the workload focus of a newly to be hired full-time faculty on the last (budget) page of the PDP. Thank you for pointing this out. What we intended to say is that the newly hired full-time faculty will teach 4 courses each academic year, at most 2 of which will be in the MSBA program. Other faculty resources will be redeployed as necessary to deliver the program. This error has been corrected in the full proposal.

"What is the relationship between the proposed program and the Data Science concentration provided in the Master of Digital Science program in the School of Digital Sciences? Two courses from this concentration are to be offered in the new MSBA program. I wonder if the establishment of MSBA will potentially take away some of the Digital Sciences students.

http://www.kent.edu/dsci/graduate/mds/data-science"

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We have discussed the implications of the new program extensively with the School of Digital Sciences and its Director, Dr. Robert Walker. It may help to understand the department's relationship to Digital Sciences. Digital Sciences is an interdisciplinary program that has no faculty of its own. Courses are offered by other programs and Digital Sciences courses are taught by faculty who have their primary appointments and oversight within another college or department. Our department offers several of the required courses and many electives in the various Digital Sciences programs. We (M&IS Department and COBA) also have faculty and administrators who are on both the advisory and the undergraduate and graduate curriculum committees for the School of Digital Sciences as well as one faculty member with a joint appointment as contributing Digital Sciences faculty - so we obviously have close ties. Thus, both our faculty and the School of Digital Sciences have strived to make our programs complementary rather than competitive, encroaching or duplicative.

Specifically, the Data Science program in the School of Digital Sciences is a 9 credit hour concentration, not a full 30 credit-hour degree program. Also, the concentration focuses on data analysis and modeling. As noted elsewhere in the proposal regarding similar concentrations at other institutions, the Data Science concentration is not comprehensive enough to present students with a full immersion in the field of analytics and inherent decision-making processes. The proposed MSBA is a business program, and as illustrated in the curriculum (Section 1 of the full proposal), the program will provide its graduates with the added advantage of approaching analytics from a business lens. Graduates from the proposed MSBA program will not only be aware of the general analytical methodologies in play but also have an understanding of the challenges involved in choosing the right problems or opportunities to address, selecting the best method(s) for analysis, interpreting the results into actionable solutions, and communicating and promoting the solution to stakeholders. Additionally, graduates of this program should be prepared to provide leadership throughout the entire process. Finally, while a graduate with a Data Science concentration may be employed by an organization as a data analyst, a graduate from the proposed MSBA program in light of her/his problem solving prowess, leadership potential, communication abilities, and broader experience as a member of a business team, may be employed as a manager, with the former reporting to her/him. A letter of support from the Director of the School of Digital Sciences is included in the appendices and discussed in Section 6.1 of the proposal.

"4. Suggestions that might help the submitting institution strengthen the proposal or refine its focus.

On page 8, the two tables should point out the size of the sample."

Substantially more content from the survey is included in the full proposal. The sample size used in all analyses is now reported as suggested. The full survey is now presented in Sections 1.4 and 2.2 with extended discussion in Appendix A.

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Central State University

"I have reviewed the proposed Master of Science in Business Analytics (MSBA) and I think it is a well thought out program and I believe Kent State's College of Business is well equipped to offer this program."

We thank the reviewer(s) at Central State University for the positive review of our proposed program and our ability to offer it.

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The Ohio State University

"Reviewers at Ohio State have returned comments on Kent State's proposal to create a MS in Business Analytics. Our faculty are supportive of the program. I submit their comments below.

1. Does the proposal conflict with anything that we presently offer (or plan to offer) at OSU--and, if so, does such a conflict raise cause for concern?

> *We don't offer a Masters program in analytics currently. So, I do not see any conflict with what we do here. However, we do have plans on launching an analytics graduate program shortly and I am putting our team together (in collaboration with other colleges). This will follow our success as a university in putting an interdisciplinary program together in analytics at UG level."*

We are confident that Ohio State's likely future graduate programs in analytics will complement our program and fill some of the need in the central portion of the state. We hope to learn from each other's experiences in establishing this program.

"2. Are there opportunities for collaboration with OSU?

> *It is difficult for us to collaborate with them because all classes are taught at Kent State in a regular in-residence format. They also seem to be self-sufficient in terms of faculty resources."*

Hopefully as Ohio State's and other existing or new programs move forward some collaboration on sharing best practices may be mutually advantageous. As noted earlier, collaboration across geographical areas for a face-to-face program would be challenging. However, we could learn from each other in other ways, plus, with maturity the program could be upgraded to online if deemed appropriate.

"3. Do you have any substantive concerns with any substantive elements about the proposal that should be communicated to Kent State University as they continue to work on this proposal? How serious, in your view, are these concerns?

> *It appears that the school has done substantial research before coming up with the plan. Given their reputation, we have no concerns about the program's academic rigor or strength."*

We thank the reviewer(s) at The Ohio State University for the positive opinion on the proposed program's quality and in our capability to implement it.

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University of Cincinnati

"Overall: The proposed program is very well-designed. KSU has done an excellent job of designing the curriculum around the expressed needs of potential employers. The focus on information and data management, data analysis, and decision-making and leadership, positions the program to produce graduates who should be prepared for successful careers in the rapidly growing field of analytics."

We thank the reviewer(s) at the University of Cincinnati for the very positive overall comments concerning the proposed program and its design. Considering that UC has substantial experience in delivering an analytics-related Master's program in the State of Ohio, we consider that opinion particularly validating.

"Section 1. I would include some of the evidence from Appendix B in the third paragraph. The evidence is substantial and adding some numbers in this paragraph makes the case more compelling."

Thank you for this suggestion. Some of the evidence provided in Appendix B of the PDP has been moved into Section 2 of the full proposal. The full proposal added an introductory section so the suggestion of adding this to Section 1 of the PDP is effectively the same.

"Section 2. "The program will require students to have completed a baccalaureate degree in STEM disciplines such as engineering, computer science, mathematics, the sciences, or in business where they would have gained the requisite background for the program." This is an excellent idea for determining whom to admit to the program. "Otherwise, prospective applicants will be required to take prerequisite courses, commensurate to their background, before they could be admitted into the program as full time students." What are the prerequisite courses or areas of study that need to be completed?"

Thank you for your support of our admission requirements, and for pointing out that we did not define these requirements. We have pointed out in Section 1.2.6 what the basic knowledge students need to be successful in the program are. Other prerequisites such as work experience and depth of academic background would then be the responsibility of the advising office to make that determination on a case-by-case basis depending on the strength of the student's transcripts and academic background. Clearly, and at a minimum, students from programs identified earlier would have had the background in mathematics, sciences, and business courses they need to do well in the program.

The full proposal includes more detailed discussions on bridge courses students need for successful completion of the program in Section 1.2.6.

"This section references the three foci model: "The final result balances these skill sets in the curriculum within our three foci model." The three foci model is not defined at this point in the document."

The three foci model was presented as a Venn-like diagram, discussed, and explained in Appendix A. We did not discuss or explain the model within the proposal due to space limitations. That has now been rectified in Section 1 of the full proposal.

We have provided more detailed discussions and explanations of the three-foci model of the

program in Section 1.1 of the full proposal.

"Section 4. This section provides excellent support for the need for this program. I would suggest that the authors consider adding some placement data. UC and NC State post this data on their websites."

Thank you very much for this suggestion on placement data. We have reviewed this data for University of Cincinnati and North Carolina State University and used them to further support the need for this program, especially in Ohio where the programs are sparse across the state. This section of the full proposal (Section 2.1) has been modified to include placement data from the University of Cincinnati and North Carolina State University. For example, according to the University of Cincinnati website, 95% of graduates from their program are employed within three months of graduation. Also, North Carolina State University reported that more than 93% of their graduates receive job offers upon graduation, with some of them receiving multiple offers. The average salaries reported by these institutions are $78,419 and $95,700, respectively.

"Section 5. The document identifies a number of companies/industries that are located in Northeast Ohio as "potential sources for enrollment." I would agree but these would most likely be part-time students. Is KSU interested in part-time students? If interested, how will the program be designed to accommodate part-time students?"

It is true that the preponderance of applicants from industry will be part time. Although the program was initially designed with full time students in mind, we have modified it to include potential part time students. The curriculum plan in Section 1.2.4 of the full proposal has been modified to include a potential course schedule for part time students.

"The document uses the size of the UC program to justify an initial size of 30 for the KSU program. The UC program is at least 60% international. Thus, unless KSU expects to have a strong international program, the UC program size would not be a good comparison."

In the past several years Kent State University has shown renewed commitment to global education and diversifying its international student body by establishing the Office of Global Education, under the Directorship of an Associate Provost. The OGE has offices across the globe including in China, India and Brazil and several departments in the university have taken advantage of this opportunity to expand their programs and the M&IS department would do the same for the MSBA programs. Further details of this is presented in Section 4.2 of the full proposal.

"Other than the marketing of the program to the PhD Project partners, I did not see any additional information on marketing efforts. In addition, I did not see any money or resources devoted to marketing. Given the competition from existing and newly developing programs around the country, KSU should be prepared to market the program."

Beyond marketing the program to PhD Project partners and globally, KSU has strategies for marketing the program nationally. More details of these strategies have been provided in the full proposal, 'Section 4.2 – Program Marketing'. No specific financial information was provided for marketing the program since the University through its University Communication & Marketing

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Office and the College of Business Marketing & Public relations Office already have offices charged with this effort for all programs. Other marketing costs will be borne by the program home department (M&IS), which as of this writing has $12,000 earmarked for that purpose.

"Section 6: I assume that "Vise president" should be "Vice President.""

Thank you for noticing this typographical error. It has been corrected in the full proposal.

"Internship opportunities were identified. Are these full-time or part-time? If full-time, when during the program should these internships be taken?"

Internship is strongly recommended for students in the program. Whether it is full or part time would be handled on a case-by-case basis depending on the student's situation. Where full time students could engage in a full time internship, part-time students may not be able to. Furthermore, internship residency at an organization would not be required since experiential learning could also be achieved through the capstone course. An internship elective was added to elective coursework.

"Section 7: This section identifies the key software that will be part of the program. How will this software be accessed? I assume KSU has excellent labs and staff to support access even if the access is remote. I would include a discussion of these facilities/resources in this section."

Thank you for this suggestion. These discussions are presented in Section '1.2.7 Program and Course Technologies' of the full proposal.

"Section 9 & Appendix D: I am concerned that the budget is flat over five years. Inflation and the cost of supporting thirty versus fifty students should have some impact on the budget. Also, as identified earlier what are the assumptions about part-time students?"

You are right, and thank you for pointing it out, that the budget presented in PDP Section 9 & Appendix D did not take inflation into consideration. We based the budget on current dollars with the assumption that increases due to inflation are likely to balance out between increase in faculty and administrative salaries and fees for students in the program. However, an updated budget that includes these inflationary forces has been included in the final proposal in Section 5.3.

"Appendix A: The focus on enterprise technology is appropriate, but EXCEL is still in wide use. I just reviewed a position posting for a treasury analyst that required spreadsheet skills along with SAS and SQL. Although the analysts will need enterprise technology skills, the users of some of their output will be far more comfortable working in a spreadsheet environment."

Thank you for your suggestion to include Excel in Appendix A of the PDP, as one of the technologies used in the program. This is most welcome given the ubiquitous nature of Excel in both academia and industry and that some of the students may already be familiar with the technology. We amended this section, now Section 1.1 of the full proposal to: "Instead of using predominantly MS Excel and statistical packages for demonstration and practice of analytical concepts, our students will interact with fully functional enterprise versions of the various software these vendors provide. This is not to say that MS Excel will not be used at all; Excel is currently an

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important component within the set of available analytical tools - as both a standalone analysis tool as well as a tool for viewing and manipulating the output of other analytical tools."

"Appendix C: I would include the tuition for the competitive programs. Even though UC and BGSU are not in Northeast Ohio, they will be part of the competition for full-time students."

For comparative purposes, PDP Appendix C (now Section 4.3 of the full proposal) has been modified to include tuition for other business analytics programs in the state; it is included in Table 11.

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Bowling Green State University

"The faculty in the College of Business at BGSU have reviewed your proposal for a Master of Science in Business Analytics.

They believe it is a well thought out program, from the perspective of a business analytics master's program. With the increasing demand in this content area, there should not be too much direct competition with other programs in the state. However, they did note that one of the BGSU related programs was missing from the proposal. Bowling Green State University (BGSU) has two analytics related masters programs. One of them, as mentioned in the KSU's proposal, is the Master of Science in Applied Statistics with a specialization in Business Analytics. This is a 39-credit-hour 2-year MS program as part of a more traditional master's program in applied statistics. Another program not mentioned in KSU's proposal, Master of Science in Analytics (33-credit hour, 12 month, full-time) (http://www.bgsu.edu/graduate/analytics.html) which BGSU started in fall 2014, is more similar to the proposed MSBA at Kent State."

Thank you for your kind words and support of Kent State University's proposed program in Master of Science in Business Analytics.

We apologize that we inadvertently omitted Bowling Green State University's 33-credit hour, 12 month, full-time Master of Science in Analytics program. We have updated our list of analytics programs in Ohio to include this program in Section 4.3 of the full proposal.

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Cleveland State University

"Responses to Kent State University's Program Development Plan for Master of Science in Business Analytics (MSBA)

Among other state schools in the region, both Cleveland State University (CSU) and Kent State University (KSU) play an important role in better serving the changing needs of the region and beyond. Businesses in all types of industries in the region are seeking new talent to stay competitive and foster economic growth. The demand for business analytics expertise is growing and is expected to increase over 20% in the next five years. The current debilitating shortage of talented business analytics professionals is compelling schools like KSU and CSU to develop and deploy business analytics programs. Given the growing demand for the program, currently CSU is also developing the Master of Science in Business Analytics program and the PDP is being reviewed by the relevant university committees. The PDP will soon be submitted to the Ohio Board of Regents for further review and approval.

The College of Business Administration at KSU proposes to establish a Master of Science in Business Analytics (MSBA). The program development plan (PDP) for the MSBA degree indicates that the degree plan is a one-year 30-credit hour full-time program with part-time options. As noted in the PDP, existing courses are used. Of the thirty (30) credit hours, twenty four (24) of the hours will be required and six (6) will be elective.

CSU supports the KSU PDP and we believe that there is a need for such a program as there is tremendous demand for business analytics professionals. The proposed courses would provide students with skills that are critical to meet industry needs. KSU has an opportunity in the region to target students in different geographic locations and contribute to the economic health of the region."

We thank the reviewer(s) at Cleveland State for their support of our program and we look forward to seeing the PDP for theirs when available. Perhaps both programs may benefit from the ideas developed in each proposal. This may also point to opportunities for collaboration between the programs.

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University of Akron

"Review of a Program Development Plan for an MS in Business Analytics, Kent State University

1) Potential conflicts with any existing program at The University of Akron and/or unnecessary duplication of programs in the state or region.

The University of Akron, as noted in the document, offers a 9-credit concentration in Business Analytics within the MBA program. Masters students in the MS/Management-Information Systems Management (MS/ISM) degree program can also take the analytics electives sequence, which gives them more of a profile of analytics graduates that is in some ways similar to prospective graduates of the KSU program. However, the authors are correct that U of A. MBA and MS/ISM graduates have neither the breadth nor depth of students graduating from a dedicated MS in Analytics program. Graduates of the MS in Statistics at the U. of A. also get some data mining and advanced statistical concepts that overlap with portions of the KSU program.

I believe that the authors' assessment of the existence of similar programs in the State of Ohio is correct. There is no direct competition for a Master's in Business Analytics in this specific area."

Thank you for the confirmation of our conclusion and for pointing out the other programs you have with some analytics content.

"2) Opportunities for collaboration with The University of Akron.

As I note below in my answer to the third question, we can roughly divide graduates into producers and consumers of analytics. KSU grads will be mostly on the producer side, whereas U of A. MBA grads are mostly on the consumer side. There is already a capstone course in the U of A. MBA curriculum that involves teams working with local businesses on a real-world analytics problem. (It is hard to imagine any business-oriented MS or MBA program without one.) An area of potential collaboration could be to link these two courses, mixing the more consumer-oriented U of A. students with the more producer-oriented KSU students. With sufficient coordination, this could aid in not over-taxing local firms who provide projects, while providing an enhanced educational experience for all involved. With sufficient coordination and the involvement of two senior faculty members (one from each institution), the existence of such a capstone class could increase the value proposition of both the KSU Analytics program and the U of A. Analytics Concentration."

We find this to be an excellent proposition and look forward to exploring it in the future. We also agree with the producer/consumer distinction between the programs and agree that combining the two types of students would be advantageous to both. Given the geographical proximity between Akron and Kent we agree with the reviewer and also see opportunities for collaboration between the analytics "producer" side of KSU's proposed MSBA program and the analytics "consumer" side of the UA 9-credit analytics concentration. As suggested by the reviewer, this opportunity is presented in the capstone courses of the two institutions where faculty and community partners'

resources could be pooled.

We believe that case-based projects, such as in a capstone course, with student teams of differing backgrounds provide great opportunity for students to learn from each other. We also believe that the type of collaboration suggested by the reviewer is doable but requires significant amount of coordination between the two institutions. We look forward to exploring this opportunity further with our colleagues at UA.

"3) Concerns with substantive elements of the proposed degree program.

How many data scientists (i.e. hard-core analytics producers) do companies need? How many consumers do they need? Demand for data scientists has been growing rapidly, and high demand has been producing high salaries. However, the need for analytically skilled consumers is far greater. In the past MBA programs have addressed the need for quantitative skills through statistics and production/supply chain/operations research classes; they often have had an implicit understanding that graduates will "pick up" sufficient Excel skills during the program. It is now clear that for consumers, this is not enough. At the University of Akron's MBA program, all students are now required to take a business analytics class. Specialized classes, such as in marketing analytics, as well as the concentration mentioned above, have been added. These graduates should be well-positioned to be consumers of analytics. They may be called upon to produce some analytics themselves, and will have the basic skill-set to do so, perhaps in collaboration with teams or outside consultants. It is clear that there will never be a time in the future when the demand for analytically-minded MBAs will diminish."

Agreed. KSU's MBA and undergraduate business programs are also moving to add more content on the consumer role in analytics.

"The mirror image requirement for data scientists is that they know enough about business to be able to work with consumers; graduates who only understand the algorithms and the formulas are akin to computer scientists who program infrastructure software such as operating systems. The concern about programs such as the KSU program is that they may be producing graduates who are so specialized in the techniques of analytics that they do not understand the business problems motivating the use of the techniques. The authors of the KSU program have designed their program with these potential objections in mind. Conceptualizing the program as comprising Information and Data Management (IDM), Data Analysis (DA), and Decision-Making and Leadership (DML) was a good way to address these concerns. And the survey described in Appendix A-1 was helpful in showing how potential employers view the needed balance.

However, there are still potential concerns. Those who matriculate with undergraduate business degrees or substantial business experience should be well-rounded graduates of the MSBA degree. Those who come from STEM disciplines may have a much harder time. Will there be enough discipline specific business education? There is room in the program for just two electives, including supply chain, marketing, and business intelligence. The program mentions adding function-specific additional courses, but there is still room for only two electives. And it is possible to finish the program without taking a single business-centered course. This puts a very heavy burden on the Business Analytics (MIS 64036) course. The only other course (besides the Capstone) with substantial business content is Analytics in

Practice (MIS 64038), which contains a lot of soft-skill topics as opposed to business-content topics."

Thank you for raising some very insightful points. As the reviewer noted we have designed our program to address these concerns. We have added additional detail to the full proposal concerning these issues. First, we have added a section detailing required bridge courses (see Section 1.2.6 of full proposal) for those without sufficient business and/or statistical background. Though we discussed the need for 'prerequisite courses' in the PDP we did not include these details. With this detail it should be clearer that a student, without past business experience or academic work, must take a minimum of our Principles of Management course and/or Leadership and Managerial Assessment as a prerequisite for the program. We have also designed business content into each of our methods courses in the form of the holistic approach we document in several areas of the proposal (the full proposal includes expanded discussion of this topic in several sections). In addition to these exposures to business principles, the reviewer is again correct in stating that additional business coverage would be found in the Business Analytics, Analytics in Practice, and Capstone courses (as well as some electives). The Analytics in Practice course includes a mix of soft skills (leadership, decision-making, project management, etc.) and business topics (working and communicating with business professionals, analytical practices within specific business functions, etc.).

Although most of the courses are not dominated by business content, as discussed above, several do focus on these issues and all will have contextual business elements. It is our view that one cannot discuss an analysis within a business setting without discussing the business issues that make the analysis meaningful. Again, it is our goal that every analytics example includes these contextual discussions. We believe that addressing business issues in every example combined with the courses that contain specific business content (along with any appropriate bridge courses) will provide the appropriate level of business knowledge to our graduates.

Would more business content lead to better prepared graduates? Clearly, adding any relevant content would be expected to increase the relative knowledge of graduates. We do see the value in adding additional business-specific content as well as additional coursework in other areas. However, developing a program such as this is a balancing act. We need to provide sufficient content in several areas, as proposed, while maintaining the attractiveness and marketability of the program in the eyes of potential students and potential employers interested in sending current employees to the program. We believe the 30 credit-hour program achieves this balance.

"The burden is also placed on ensuring that the pockets of business content encapsulated in the assignments given in the more technical classes will provide rich business content, so the execution of this part of the program will become critical for producing the kind of graduates the program envisions. Currently the program envisions oversight by "a subcommittee of the College's Graduate Council, made up of graduate faculty from the home department, [which] will oversee curricula matters…" An integrated curriculum such as this will need tight coordination; my experience with faculty committees is that they are rarely as effective as they should be in this regard."

We completely agree with the reviewer in that, no matter what our intentions are and no matter how well we design the program, optimizing the success of this program depends on the required courses not simply being taught well, but taught in a very specific manner with the program's holistic philosophy in mind. Oversight by the graduate council subcommittee insures that curricular matters do not reflect only the view of a single person. This does not mean that there is no one to keep their eye on the big picture and assure the program maintains its designed philosophy. The program will also have a Program Advisor and a Faculty Director who will work with the curriculum committee to ensure this oversight.

"Of course, the authors of the program will note that I did not discuss the capstone class, Capstone Design in Business Analytics (MIS 64040), in the previous paragraphs. Here too students are expected to master deep business context for the given problem area. It is difficult to find projects that are at the right level of difficulty, which also exercise a substantial portion of the skill sets the students have acquired. The latter is the key in transforming passive knowledge into active knowledge. So the outstanding execution of this part of the program will also be a critical success factor."

We also agree that the implementation and execution of the Capstone Design Course is critical to the program quality. Project choice in such a course can be difficult. We do have experience with other capstone project oriented courses in our undergraduate and graduate programs so we believe we do have a realistic view of the challenges involved. Fortunately, our Center for Information Systems program gives us substantial access to many of the area's major employers. Although, as the name implies, the Center is focused primarily on our information system programs, they have also taken an interest in our efforts toward this proposal. We hope to use these (and other) business contacts to enable using real analytics problems from local industry in the course. As a backup, we note that there are many emerging resources and realistic cases being produced in the area of analytics. Many of these resources are being made available by vendors such as SAP as it is evident that they believe one obstacle to their sales is a lack of knowledge and education among their customers. Although finding cases that involve as many of the program concepts as possible is a positive, we think that the experiential learning involved in going through the full *process* of a realistic analytics problem to be the most critical element of the course.

"I am concerned that the students who try to complete the program in 9 months will be taking this capstone course having only completed one full semester of classes. Is the nine month program really a viable time-frame? They will be encountering materials in the other courses for the first time, yet they will be expected to apply these materials in the capstone class. For example, let's assume that "Naïve Bayes classification" comes at the end of Advanced Data Mining and Predictive Analytics (MIS 64037); this will be too late to use it in Capstone Design in Business Analytics (MIS 64040). The same can be said for Quantitative Management Modeling (MIS 64019), which would be an important source of understanding of prescriptive analytics, a key element of the capstone course. Otherwise, the ambitiousness of the capstone course has to be scaled back, possibly to the point of not serving its purpose."

We have clarified in the full proposal that the 9-month alternative would only be appropriate for an exceptional student with requisite experiences. The type of student envisioned here has substantial mathematics or statistics education and business experience. Perhaps, they are already doing

analytics (or related activities) in industry but desire (or need to have for specific opportunities) a degree in analytics. These types of students would bring a lot of prior experience with them and would likely be able to apply concepts they are taking concurrently with the capstone course since it would usually not be the first time they have encountered those topics. Many of these would remain employed and select a part-time schedule; however, others may be able to take a hiatus or their employer may support a leave of absence to develop these skills in-house. The 9-month alternative would likely appeal to this group of students due to the need to take a shorter work absence. The concern the reviewer expresses is very much shared by us and the vast majority of students would not be sufficiently prepared to select this option. We expect the 12 month full-time and the part-time options to be selected by the great majority of program entrants.

"Another potential danger of the KSU program is overfitting the program to the SAP environment. In general, I think that it is a good idea to give the graduates data management skills. SAP is fairly pervasive, but is by no means ubiquitous. MS-Analytics grads need to be able to understand the firm's information architecture (i.e., "the data model" of the firm), data definitions (master data management), and even some aspects of information governance. Too much emphasis on SAP may produce graduates who only see information architecture through this specific lens."

This point has also been brought up by respondents to our industry survey and other RACGS reviewers. The program was not designed to be dominated by any specific, especially proprietary, technology. We felt that being able to provide the students with access to enterprise-level technologies such as SAP and Oracle is a strength of the proposed program (and still do) so this content may have been emphasized to the point that readers believed these technologies would dominate the program. We have revised the full proposal to better describe our use of these technologies and also our technology-agnostic philosophy in this and our other departmental programs. A good summary of our view is covered by a question from an industry-survey respondent which is reproduced below and appears in Section 1.4 and Appendix A of the full proposal:

> **Survey Question A2.4: This is an interesting comment that we do agree with 100%. We have emphasized that our students will have access to, and the curriculum will cover, several major categories and brands of software such as SAP and Oracle. We, as a department, have taught aspects of these technologies in other programs and all of these programs, including the proposed MSBA, share a common philosophy in using these software packages. We use specific software to demonstrate general concepts and give students some applied hands-on experience with an example technology. Care is taken to focus on the general underlying concepts with a technology-agnostic view. For instance, the Database Management and Database Analytics course that is proposed in this curriculum is a slightly adapted version of a long existing course in the information systems concentration of our MBA program. This course has used Oracle as the main course technology for over a decade. However, due to the technology-agnostic design of the course, there would be no meaningful change to the course topics or pedagogical methods if we had to suddenly change databases to DB2, MySQL, SQL Server, or any relational database. There are, of course, topics specific to Oracle Administration and such that should be covered if this was an 'Oracle Course' rather than a 'Relational Database Course' but these topics are appropriately avoided. Oracle is used as the course example of an enterprise-level database management system and serves as the environment in which students practice their learned general database concepts. This is the same philosophy that we will implement technologies such as SAP and Oracle within our course designs in the MSBA program. We believe that having a little hands-on experience with industry software such as these will only make our graduates more attractive to employers in general; however, we have no intention, and will actively avoid, constructing a curriculum around a specific brand of or type of software. It should be noted that our**

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discussion of the curriculum in a previous section specifically states we will also use general statistical software such as SAS, R, and JMP as well as more universal software such as MS Excel. Data analysis techniques will generally be explored using statistical or modeling software and then, where appropriate, will be further explored by investigating the implementation of that method within a specific environment such as SAP.

"Finally, the proposal never mentions important concepts such as "ethics" and "social responsibility." There is a growing body of cases involving blunders made by firms with personally identifiable information. One particularly famous incident is when Target sent coupons to a family that tipped off a father that his teenaged daughter, unbeknownst to him, was pregnant. Target went on to disguise what they were doing by randomly arranging the coupons related to pregnancy amongst those it thought would be of no interest, so as to not tip off the consumer what it was doing.[3] Data scientists will be on the front lines of raising awareness of potential ethical conflicts. These issues need to be addressed in this program."

Thank you for pointing out the omission of these important topics from the proposal. The Business Analytics and Analytics in Practice courses will have specific formal content targeting these topics. As part of the business contextual elements of examples in analysis-oriented courses, any ethical or social issues related to the specific problem should also be part of that discussion. <u>This has been added to the discussion of the curriculum in Section 1.1 of the full proposal.</u>

"4) Suggestions that might help Kent State University strengthen the proposal or refine its focus.

On page 3 of the proposal, it is noted that "Additionally, in a survey of Northeast Ohio businesses the respondents indicated that the cumulative increase in the number of analytics employees within their organizations would be by 97.5% over the next three years." Are these predominantly analytically minded consumers, or are these true data scientists? There are a few more results from this survey at this point in the proposal, and then other results elsewhere, but it is difficult to know exactly what survey the authors are referencing. (They say "Other results from this survey can be found in Appendix A." Is this the survey they themselves ran?)"

We apologize for any confusion concerning the survey introduced in the PDP. This was indeed a survey of industry that we conducted ourselves. In the PDP we included a few selected results but in the full proposal we present and discuss each of the survey questions. As part of this we detail the survey process and the respondents. Most of the respondents are technology-oriented strategic-level officers in their organizations. <u>All survey information can be found in Sections 1.4, 2.2 and Appendix A of the full proposal.</u>

[3] Duhigg, C. (2012, Feb. 16). How Companies Learn Your Secrets. New York Times. Available at: http://www.nytimes.com/2012/02/19/magazine/shopping-habits.html. Retrieved February 9, 2015.

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"I have a similar comment about those results in Appendix A: The survey results presented in Appendix A-1 show good results for the acceptance of the program by employers. However, the answers do not give a sense of how many actual positions there may be for full-fledged data scientists in these companies. While a company such as Procter and Gamble can afford to maintain a large complement of data scientists, many other firms may have room for no more than a few. It would also be more persuasive if the authors included the number of surveys sent and the response rate."

Sample-size, response rate, and other survey metrics are presented in Section 2.2 of the full proposal. The respondents were given a definition of 'analytics workers' within the question (see question A1.8 in the proposal). The responses would be associated with that provided definition (reproduced below):

> **"Analytics Workers" are any employees who spend a significant portion of their work day engaged in analytics activities. They may or may not be called business analysts by your organization. Examples of analytics activities include (but are not limited to): data management, data manipulation, creating statistical and non-statistical models, data visualization, data analysis of any type, report generation, and communication of analytical results.**

"On page 7 of the proposal, the table showing the balance of the program aspects says "Data Analysis" rather than "Data Analytics." On page 8 of the proposal, it is stated that the business content portion of the technical classes should comprise 10-20%; in the description of these courses only the lower 10% appears. This is a big difference with implications for the overall business content in the program. The faculty committee overseeing curricula matters may not have enough effective authority to ensure the tight coordination of the three "foci" of the program; it is recommended that this mechanism be strengthened."

The first point, concerning the data analysis label, was an editing error. A proof-reader had changed some of the earlier references to the data analysis focus to data analytics assuming that was what was meant. All references to this focus should read 'data analysis' rather than 'data analytics'. The full proposal has been corrected in this and a footnote was added explaining why this is not called data analytics:

> **The focus named 'Data Analysis' is intentionally not named 'Data Analytics' in this model. It is our view that the profession of business analytics encompasses all three foci and, therefore, no one of them would be properly termed 'analytics'. 'Data Analysis' was chosen to convey that this is the computational component of analytics but is not analytics by itself.**

The second point concerning the 10-20% figure for 'business content' points out that, in the breakdown of coverage in each course, the data analysis courses show that 10% should cover the DML (Decision-Making and Leadership) focus (as well as 10% on the IDM focus, and 80% on the actual data analysis). We feel these figures are not conflicting - with some explanation. The issue is simply that 'business content' is broader than the *specific* business issues described within the DML focus. The IDM (Information and Data Management) focus also includes 'business content'. Business issues such as data accessibility, obtaining data sources, ethics concerning data management, etc. would be considered part of the IDM focus. Additional business issues not specifically categorized into any of the foci may also be introduced within the context of the problem. For instance, Healthcare management is not specifically covered in our foci but might be

discussed briefly while introducing an analytics problem from the healthcare sector. For these reasons we believe 10-20% to be a good target for all business content while 10% is a reasonable target for the DML focus alone.

"On page 12 of the proposal, the McKinsey study is cited without a proper reference – the web link does not lead to the actual study, and no publication date is given. This is not a moot point, because these numbers for potential job needs have now been circulating since May, 2011—are they still valid? Very little is stated in that McKinsey report about the methodology used to make the estimate.

Where appropriate in this document, references should be complete."

We have fixed the McKinsey reference and other references in the full proposal. As for the report itself, as it is cited very often it would appear that most consider the information valid. We also have added another report from McKinsey from two surveys conducted in 2012 and 2013 that show dramatic growth in applied analytics activities between those two years, supporting the projections made in 2011 (see Figure 3 in the full proposal). Additionally, toward the central point of whether the projected growth figures are valid we provide evidence, not only from McKinsey, but also from Accenture, the Bureau of Labor Statistics, growth of other analytics programs, as well as projections from local industry members within our own industry survey.

"Finally, the proposal is not explicit about what statistics background the students are expected to have. In fact, the word "statistics" is never mentioned in the proposal in the context of materials to be covered in any of the courses or entrance requirements. Is this folded into Business Analytics?"

The expected statistical background has been added in the full proposal by the addition of Section 1.2.6 'Bridge Courses'. Statistical methods will be covered in Business Analytics as well as in the first and second data mining/predictive analytics courses. This second course, entitled 'Advanced Data Mining and Predictive Analytics', has had its description changed to better reflect the content. Previously, it listed example methods. This has been changed to stating that statistical and machine learning methods will be covered. Quantitative Management Modeling and Big Data Analytics contain specific statistical content as well (though Quantitative Management Modeling is dominated by non-statistical methods).

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Miami University

"Miami University Review of Kent State University's

Program Development Plan for Master of Science in Business Analytics

The stated goal of the Master of Science in Business Analytics (MSBA) at Kent State University is to "produce graduates that understand and are ready to implement business analytical methods in realistic business contexts." The proposal further clarifies that the term 'ready to implement' implies they are both aware of the methodologies and understand the challenges to choose the right problem, select the best tools for analysis, interpret the results, and communicate the solutions to stakeholders. The recommended program is a 30 hour program, with 24 hours of required material and 6 elective hours.

Strengths: I found several strengths in the program development plan (PDP). The authors have clearly researched other programs in the U.S. and Canada, and their planning has been informed by the current mass market literature and involvement with professional societies. One of the notable strengths in this PDP is in the discussion of the balance required among three main areas in analytics: Information and Data Management, Data Analysis, and Decision-Making and Leadership. I was pleased to see that each course included in the core curriculum gave an approximate percentage breakdown of the treatment of these three areas. I see this as a particular strength because business analytics is multidisciplinary. The commitment to blending these lessons throughout their core will help to focus the faculty on the "right" topics, and educate the students of the natural blending of these subjects in the field."

We thank the reviewer(s) for the positive discussion of the proposed program's strengths.

"In my review I was asked to comment on the following specific issues:

1. Market need for the proposed program and the distinctions or differences between the proposed program and other similar programs across the state.

There is clearly a need for more undergraduate and graduate students in business analytics. The PDP does an adequate job of motivating this need. They note two other master's programs, and a few undergraduate programs in the state. They do not reference the Business Analytics undergraduate programs (minor and co-major) at Miami University which have over 200 students currently enrolled."

We regret this omission and the full proposal (Section 4.3) has been updated with this information.

"The differences between the proposed program and those at University of Cincinnati are and Bowling Green State not clear in the PDP. The authors only state that the proposed MSBA program is "designed to bridge this gap and meet the needs of students and employers in northeast Ohio." Although this was not clear in the PDP document, from my own knowledge of the two existing programs, I assume that the proposed program will be more managerial and less technical than those offered at UC and Bowling Green State. I would like to see more clarification of the specific differences between the proposed program and the two existing master's programs highlighted in the PDP."

The reviewer reiterates their request for these analyses in their final question. These questions are fully discussed after the reiteration in the final question below.

"On a related note, in the table in Appendix C, in the column labeled "Comments", it is noted that the Kent State program will produce "Data analysts with both analytical and strategic decision making skills". It is also anecdotally noted that the program at UC is far from Northeast Ohio, and cannot serve the needs of the region. Additionally, the program at Bowling Green State is noted to be comprehensive but cannot fulfill the growing needs of the region. I would like to see more evidence to indicate that these two existing programs are inadequate to serve the needs of Northeast Ohio."

Although the regional needs specific to northeast Ohio are important and will be further discussed and justified, we feel it is important to note that the needs for more education in the domain of analytics in general is an international, national, state, and regional issue. There are plenty of sources projecting an international imbalance of national analytics needs and supplies with the United States consistently being projected as the nation that will have the largest need…and the largest shortfall of talent. As new programs are being introduced across the nation, it should be noted that these projections already anticipate a growth of academic programs serving the domain. The national case has been extensively studied and we provide multiple sources of external evidence of this in Sections 2 of the full proposal. A recent (2012) quote from an Accenture report states the following. "Among the countries studied, the United States is projected to create 44 percent of the new jobs for analytics experts but only 23 percent of the supply, leading to a shortfall of nearly 32,000 workers. The shortfall in Brazil will be nearly 19,000 workers because the country will create almost 5 percent of the new analytics expert jobs but produce less than 1 percent of the new talent. On the other hand, India and China will have surpluses of more than 72,000 and 18,000 analytics experts, respectively."[4]

On the regional-level, we found Bowling Green has added a second related master's degree so we will review the three other programs in the state but importantly note that these are offered by only two other institutions, neither of which serves the same specific local geographic area that Kent State serves. This geographic component is a critical one as it is a very important decision determinant for those potential students who cannot or simply do not want to move their residences.

Regionally, Kent State University primarily serves the area described by the US Census Bureau as the Cleveland-Akron-Canton, Ohio Combined Statistical area which has a population of 3.5 million people (2013 US Census). We note also that we serve non-metropolitan counties as well such as Wayne, Trumbull, and Columbiana (and further note we serve a large number of state, national, and international students as well). KSU is not the only college or university that serves this region of course; we note our colleagues at University of Akron, Cleveland State University, Youngstown State University, Case Western University and others also serve portions of this region. This

[4] Elizabeth Craig, David Smith, Narendra P. Mulani and Robert J. Thomas, "Where will you find your analytics talent?," Outlook, October 2012.

actually bolsters our need argument – if it takes this many academic institutions to serve the other academic needs of this population center, it should be expected that at least one analytics-focused graduate program is needed for the region. Since we are solely interested in discussing Master's-level Analytics Programs in this comparison, the remainder of this discussion will be limited to institutions who currently offer these programs (Bowling Green S.U. and U. of Cincinnati) along with the proposed program at KSU.

For some students who are willing to change their residence to somewhere outside of their current commuting limits they may decide to go to any in-state or out-of-state program based on many different criteria. However, for the large numbers of potential students who do not have the luxury to move wherever their educational desires may take them, currently there are few options in this heavily populated metro area. Since academic analytics programs are a relatively new phenomenon, we anticipate more than usual demand from older students who are established in the area and are likely unable or unwilling to relocate but still wish to pursue this new opportunity. That is a primary reason the program is designed to incloude a part-time option.

Obviously, for those unable or unwilling to relocate from the Cleveland/Akron/Canton metro area, attending the program at the University of Cincinnati would not be possible. For the programs available at Bowling Green, two of the western most counties in our described primary service region (18 counties) may also be served by BGSU. However, for the much more population dense counties eastwards toward Cleveland and Akron, commuting to BGSU quickly becomes impractical for most people.

"2. Opportunities for collaboration with the RACGS member's own institution

As noted earlier, Miami University's Farmer School of Business has an undergraduate minor in Business Analytics and a co-major (joint with the Department of Statistics). The minor has been in existence for several years, and the co-major since January 2014. Current enrollment includes over 150 Business Analytics minors and 50 co-majors. I see some opportunities for collaboration in terms of sharing classroom best practices, joint research, and other areas."

We fully agree that this type of collaboration would benefit both institutions and their students. We look forward to engaging in the discussion.

"3. Concerns with substantive elements of the proposed degree program

I have no substantive concerns regarding the planning or content of the curriculum. I think it has been well planned and researched. The courses included are relevant to the needs of graduates of such a program and seem well thought through. My only suggestion is to consider the Informs Certified Analytics Professional (CAP) job task analysis study. The CAP exam is currently being used to certify experienced analytics professionals. The job task dimensions outlined in these documents will give further support to the curriculum planned for Kent State University."

We thank the reviewer for the positive comments and the very good suggestion as using the CAP program to the discussion as it does support our curriculum choices well. We have looked at a

great deal of material from INFORMS in our development process, including CAP, but did not discuss this at all in the PDP. We have now added a section, '1.2.3 Program Congruence with Industry Standards – The Certified Analytics Professional' to the full proposal.

"4. Suggestions that might help the submitting institution strengthen the proposal or refine its focus.

Most of my concerns and suggestions have been addressed in my earlier comments. However, I wish to reiterate my suggestion for providing stronger evidence to support the specific differences between the proposed program and the two existing programs in the state, along with better documentation as to the need for an additional program to service Northeast Ohio."

We have substantially increased the discussion concerning the program demand and employment opportunities. This can be found in the full proposal throughout Section 2. In order to fulfill the request for more information on a comparison of the state graduate analytics programs, along with the need for a program in Northeast Ohio we have constructed the following tables.

The first table below provides a comparison between the programs at UC and BGSU and the proposed KSU program. As they all provide education in the same central domain there is no surprise that there are some similarities in the coursework. However, it can also be seen that each program has a level of distinctiveness. There are some differences in coursework along with differences in number of total and required credit hours. KSU's distinction in this group is the more formal way we address the contextual skills (technical and business/management) in the program as well as our holistic approach of addressing each of our defined foci in each course (to a greater or lesser extent depending on the course).

The second table below makes the case for the need for a comprehensive graduate analytics program in the region Kent State serves (NE Ohio). For local students, who cannot or will not relocate to attend a program, there are no options in the highly populated northeast corner of the state. This is really a simple question of geography as the table points out. The table displays the *one-way* commuting distance and time between the physical center of Northeast Ohio counties and each of KSU's and BGSU's locations. The University of Cincinnati was not included in the table simply because the distances involved are obviously out of range for commuters. As can be seen, although BGSU undoubtedly serves its local population well as well as those who wish to relocate to that campus, the one-way commuting time to all the counties we include in NE Ohio, except one, are greater than 90 minutes (again, each way). While some of these counties also have a significant commute to KSU, they are significantly more realistic than the commutes to BGSU. The result of this analysis demonstrates that for these counties, there are currently no options for a graduate analytics degree for residents who do not wish to relocate. It is notable that the total population of these counties approaches 4.3 million people (approximately 37% of the total population of the State of Ohio).

Both of these tables and discussions have been added to Section 4.3 in the full proposal.

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	Kent State University Proposed MSBA	**Bowling Green State University MSAS w BA**	**Bowling Green State University MSA**	**University of Cincinnati MSBA**
Degree Name	M.S. in Business Analytics	M.S. in Applied Statistics with a specialization in Business Analytics (specialization adds 6 cr. hrs)	M.S. in Analytics	M.S. in Business Analytics
Self-description (from website for BGSU, UC or from proposal for KSU)	The disciplinary purpose of the program is to produce graduates that understand and are ready to implement business analytical methods in realistic business contexts. By being 'ready to implement' business analytical methods, we mean that the graduate is not only aware of the analytical methodologies in play but also has an understanding of the challenges involved in choosing the right problems or opportunities to address, selecting the best method(s) for analysis, interpreting the results into actionable solutions, and communicating and promoting the solution to stakeholders. Additionally, graduates of this program should be prepared to provide leadership throughout the entire process. The balance the program strives for would be towards a mixture of 50% Data Analysis (DA) with the other 50% split evenly between both Information and Data Management (IDM) and Decision-Making and Leadership (DML).	BGSU is excited to offer the MSAS with a specialization in business analytics. The explosion of modern computing power and data acquisition techniques has created a profession generally known as business analytics that is in increasing demand. The job market seeks people with a strong background in fundamental statistical training, a solid exposure to operations research, and a firm understanding of management of information systems and business operations. Writing on the growing opportunities in the fields of business analytics and big data, McKinsey & Company, a global management-consulting firm, found that "by 2018 the United States alone could face a shortage of 140,000 to 190,000 people with deep analytical skills." The business analytics specialization at BGSU prepares students for this exciting new career. The specialization adds six credit hours to the standard MSAS curriculum, with courses covering data mining, time series analysis, and linear and integer programming. It also adds additional elective options in economics, business administration and computer science.	PROGRAM STRENGTH AND UNIQUENESS •Full-time, cohort, 12-month program •Focus on hands-on experience and applications •Analytical skills in descriptive, predictive and prescriptive analytics •Technical skills in database management, business intelligence and big data analytics •Soft skills in management and leadership •An integrated experience in analytics projects •Taught by full-time faculty •Collaborations with the Center for Business Analytics	The program is designed to provide a strong foundation in all the areas of business analytics, while allowing considerable flexibility so that students can individually tailor their programs according to their interests or career plans. The program requires the completion of 33 semester credits. Additional graduate hours may be required to meet program prerequisites.
Total Hours	30	39	33	33
Required Course Hours	24	30	33	23

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Elective Course Hours	6	9	0	10
Required Courses	Business Analytics Database Management & Database Analytics Data Mining Techniques Advanced Data Mining and Predictive Analytics Quantitative Management Modeling Analytics for Big Data Analytics in Practice Capstone Design in Business Analytics	Probability Theory I Mathematical Statistics II Business Database Management Linear and Integer Programming Regression Analysis Experimental Design Time Series Analysis Data Mining *Choose 1 of:* Applied Probability Probability Models for Decision Making Thesis or Comp Exam	Regression Analysis Database Management Exploratory Data Analysis Decision Optimizations Analytics Project I 1 hour Time-Series Analysis and Forecasting Business Intelligence Data Mining Big Data Analytics Analytics Project II 1 hour Advanced Data Analytics Project Management Analytics Project III 1 hour	Optimization Modeling Probability Modeling Optimization Methods Statistical Methods Simulation Modeling Statistical Modeling Statistical Computing Data Management MS Capstone
One Semester Full-time Instructional Fees[5]	Resident: $4,516 Non-Resident: $8,274	Resident: $5,084.00 Non-Resident: $8,738.00	Resident: $5,084.00 Non-Resident: $8,738.00	Resident: $9,640.00 Non-Resident: $12,059.00

[5] OhioHigherEd: University System of Ohio. "Fall 2014 Survey of Student Charges for Academic Year 2014 – 2015." https://www.ohiohighered.org/sites/ohiohighered.org/files/uploads/data/statistical-profiles/tuition-finaid/FY15%20Tuition%20and%20Fees%20Survey.pdf. Retrieved January 20, 2015.

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Table. Comparison of One-Way Commuting Distance/Time by County.

County	BGSU Miles	BGSU Minutes	KSU Miles	KSU Minutes	Time Increase to BGSU	County Population
Columbiana	193	174	46	56	210.7%	107,841
Mahoning	173	164	47	53	209.4%	238,823
Ashtabula	171	163	83	79	106.3%	101,497
Tuscarawas	169	175	64	69	153.6%	92,582
Trumbull	168	159	38	59	169.5%	210,312
Stark	166	151	31	44	243.2%	375,586
Lake	145	144	37	59	144.1%	230,041
Portage	143	137	7	17	705.9%	161,419
Geauga	141	137	25	37	270.3%	93,389
Holmes	139	133	69	78	70.5%	42,366
Summit	134	130	10	24	441.7%	541,781
Wayne	134	120	44	50	140.0%	114,520
Cuyahoga	122	113	29	36	213.9%	1,280,122
Ashland	114	105	60	59	78.0%	53,139
Medina	100	122	37	46	165.2%	172,332
Lorain	95	99	52	58	70.7%	301,356
Erie	93	91	73	72	26.4%	77,079
Huron	67	80	74	83	-3.6%	59,626
					Total	4,253,811

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University of Dayton

"RACGS Review

1. Based on macro market trends, there appears to be a need for individuals with an MS in Business Analytics (MSBA). The Kent State proposal does a nice job of identifying the limited number of similar degrees available throughout Ohio and how the proposed program is different from the existing programs."

Thank you for validating our discussion of these issues.

"2. I currently do not see a direct opportunity for collaboration between Kent's MSBA degree program and the UD MBA program. The geographic distance between the schools and fact the UD does not offer a MS in Business Analytics make collaboration unlikely. However, there could be some potential collaboration when/if the online the MBA program is developed and a course in business analytics is offered."

It is challenging for the reasons described by the reviewer. However, as the field and each school's programs evolve, there will likely be better opportunities for various collaborations and we look forward to investigating those when they become apparent.

"3. (&4) I've read through the entire proposal and believe that development, implementation, and administration of the program are each well covered and supported. Further, the projected budget seems realistic in terms of enrollment numbers and all of the costs are considered in the projection. I do not see any area that has not been addressed in the proposal and I do not have additional recommendations or concerns regarding the proposed MSBA program."

Thank you for your positive review of our proposal.

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Youngstown State University

"Please comment on the proposal as well as your perception of the institution's capability to deliver the program with particular attention to the following:

Market need for the proposed program and the distinctions or differences between the proposed program and other similar programs across the state

In recent years, there is a growing need for students who possess both business knowledge and analytical skills to make use of large data sources for decision making. The proposed MSBA program can potentially meet this need in NE Ohio. It also differentiates itself from the similar programs offered by Case Western Reserve University and the University of Akron."

We agree with the assessment that there is demand for such a program and that the proposed MSBA has the potential to fulfill some of this need.

"Opportunities for collaboration with the RACGS member's own institution

Maybe we can share some experience in this field in the future."

Perhaps there will be the opportunity to share best practices and other knowledge as the field and our institutions move forward.

"Concerns with substantive elements of the proposed degree program; and

It is understandable that the proposed program has a business and communication component in it; however, it is over-emphasized in the program. In many schools, business analytics is a STEM program. While communication and business skills are necessary, they are certainly not the core component of the program."

We have added substantial content to the full proposal discussing and justifying our program design. We are hopeful that the new content throughout Section 1 of the full proposal helps to justify this content in the program. We would especially point the reviewer to the added mapping of our program to the tasks included in INFORMS Certified Analytics Professional (CAP) program found in Section 1.2.3. As can be seen, our program has good coverage across all categories of CAP topics and this helps validate that the program is targeting what the industry has deemed important.

The reviewer makes the specific observation, "While communication and business skills are necessary, they are certainly not the core component of the program." We would agree fully with that statement. The Data Analysis program focus is actually the core component of the program since it makes up 50% of the content. Additionally, the Information and Data Management focus and the Decision-Making and Leadership focus each makes up a smaller portion of the content and it should be understood that these topics are discussed from a practical viewpoint and a focus on

what an analyst needs to know. For instance, the decision-making content will focus on making analytics-related decisions rather than general decisions. While different reviewers will undoubtedly have different opinions concerning the appropriate level of coverage associated with all the foci and topics, it should be noted that the vast majority of feedback supports the balance we describe in the three-foci approach. In fact, in the survey of local industry, they were asked to select the weight of coverage they thought was appropriate for these three foci. Interestingly, their aggregate response had a greater weight of material on the business and other issues components and a lesser emphasis on the Data Analysis portion (41% vs. our proposed 50% - though it was still the highest weighted focus). See Sections 1.4 and 2.2 on the industry survey discussed in the full proposal for further detail. We do readily admit that, even with all the effort we expended in the attempt to get the balance 'right', we cannot know if we have truly hit the optimal balance. What will be critical is following up with employers of our first graduates (if the program is approved) to gain insights into what they think the strengths and weaknesses of the employed graduates' preparation were. Certainly, as part of continuous improvement efforts, we will be looking to confirm the balance we chose or to identify adjustments that should be made to meet the expressed needs of these employers.

"The proposed program involves courses offered by other departments or colleges, like computer science and library science. While it can save cost and make use of readily available resources, coordination can become a potential issue. In addition, the plugged-in approach may not serve the purpose of program well and may affect program quality as courses are not customized for the MSBA program."

We have a very good working relationship with our colleagues in other departments that will offer coursework within the program. We have had very good discussions and will continue to follow through on communication and coordination with the departments and instructors of those courses. We are confident that the courses we have included from other departments will meet the needs of the MSBA well; however, as was discussed to the previous answer, measuring the success of the program by interviewing or surveying potential employers, employers of our graduates, and our students will aid us in ensuring that the reality is as functional as the design. Certainly, if we have concerns about any course that may not be meeting the program's needs, we will actively work with the course's department and instructors to amend the course to better meet these needs. If that will not work well, perhaps because the home department has developed different needs for their own students, and an impasse is reached then other arrangements for the course would be required at that time. This would most likely result in developing a new course specifically for the MSBA program.

"Suggestions that might help the submitting institution strengthen the proposal or refine its focus.

To be successful in this program, students need to possess a certain degree of quantitative skills; otherwise the pace of the courses will be slowed down.

Data analytics involves using computer packages. Teaching the course is not something like a "click here and there" approach; otherwise, the things people can do is very much limited to what the software

package offers. Therefore, some training for basic programming skills and logic is necessary. With these basic skills, students can do quite complicated and flexible analyses with widely available and adopted tools like Excel.

For all the prerequisite courses, the course name and the brief descriptions of the courses should be provided."

Thank you for these recommendations. Students without necessary quantitative skills will be required to take an introductory graduate level statistics course as a prerequisite. The course is described in the section on bridge courses (Section 1.2.6) in the full proposal. Computer packages will not be taught using a click this then this approach. The student should understand the problem, process, and application well enough to determine for themselves what the next steps should entail. Excel will play a large role as both a standalone analytics tool as well as a tool for viewing and manipulating the output of other analytics software. Basic programming logic will be covered and students will be exposed to programming in an Excel environment as well as writing statistical scripts in R and SAS. SQL, though not 'programming' *per se* will also receive significant coverage.