



University Senate TRANSMITTAL FORM

Senate Document #:	16-17-22
PCC ID #:	16035
Title:	Establish an Online Offering of the Master of Science in Business Analytics
Presenter:	Andrew Harris, Chair, Senate Programs, Curricula, and Courses Committee
Date of SEC Review:	January 30, 2017
Date of Senate Review:	February 9, 2017
Voting (highlight one):	<ol style="list-style-type: none"> 1. On resolutions or recommendations one by one, or 2. In a single vote 3. To endorse entire report
Statement of Issue:	<p>The Robert H. Smith School of Business proposes to offer an online version of the existing Master of Science in Business Analytics program. The University System of Maryland and Maryland Higher Education Commission require approval for a new online offering of an existing face-to-face program if more than 50% of the program's courses will be offered online. For this online version of the program, all of the courses will be offered online. The proposed online offering features both synchronous classes and asynchronous materials online. The synchronous component will have regular class sessions with instructors leading student sections using a video conferencing system that features each participant in a separate real-time window on the screen. Asynchronous material consists of video lectures, simulations, problem sets and similar materials that will be available to registered students on a MOOC platform or similar online-learning platform. If Smith chooses to make the asynchronous material available through MOOCs, students in the online degree program will be completely separate from students enrolled in the MOOCs.</p> <p>The existing Master of Science in Business Analytics is a new program, having been approved during the 2015-2016 academic year. Students in the program develop significant mathematical, statistical, and computational capabilities. Graduates will use</p>

	<p>these skills in order to understand, manage, and use large amounts of data for optimal business and organizational decision making. Careers that demand higher level analytics skills are projected to increase, and an online version of this program will help to meet this demand. Offering the online program in conjunction with MOOC offerings could provide multiple benefits. For recruiting purposes, MOOC offerings help to market the degree program throughout the world, and also provide an opportunity to identify strong prospective students for the degree program. MOOCs also provide additional insight into course effectiveness, as data from thousands of MOOC students can be collected and used to improve course materials.</p> <p>As is the case with the existing degree program, the online offering will consist of ten three-credit courses. The content of the online version of the program is very similar to the existing program. The four required core courses are the same; the main difference is that there are more possible electives that will be offered. The program will be offered in 10-week terms (with 4 terms per year). The online version of the program is designed to meet the same learning outcomes as the existing program, with comparable assessment strategies.</p> <p>There are no significant financial implications with this proposal, although some resources will be required to initiate the online offering. The proponents are in discussion with the Provost regarding this funding, which will ultimately be reimbursed.</p> <p>This proposal was approved by the Graduate School Programs, Curricula, and Courses committee on November 30, 2016, and was approved by the Senate Programs, Curricula, and Courses committee at its meeting on December 2, 2016.</p>
Relevant Policy # & URL:	N/A
Recommendation:	The Senate Committee on Programs, Curricula, and Courses recommends that the Senate approve this new online offering of the existing MS program in Business Analytics.
Committee Work:	The committee considered this proposal at its meeting on December 2, 2016. Judy Frels and Sandra Loughlin of the Robert H. Smith School of Business, and Ben Bederson, Associate Provost for Learning Initiatives, presented the proposal and responded to questions from the committee. After discussion, the committee voted unanimously to recommend the proposal, contingent on the Smith School incorporating committee suggestions into a

	revised proposal. The revised proposal was submitted in January 2017.
Alternatives:	The Senate could decline to approve this online offering of the program.
Risks:	If the Senate declines to approve this new online offering, the university will lose an opportunity to create an online offering of a program that meets a growing need in business analytics.
Financial Implications:	There are no significant financial implications with this proposal, although some resources will be required to initiate the online offering. The proposers are in discussion with the Provost regarding this funding. It is expected that the revenue generated by the program will be enough to sustain the program.
Further Approvals Required:	If the Senate approves this proposal, it would still require further approval by the President, the University System of Maryland, and the Maryland Higher Education Commission.

THE UNIVERSITY OF MARYLAND, COLLEGE PARK PROGRAM/CURRICULUM/UNIT PROPOSAL

- Please email the rest of the proposal as an MSWord attachment to pcc-submissions@umd.edu.
- Please submit the signed form to the Office of the Associate Provost for Academic Planning and Programs, 1119 Main Administration Building, Campus.

PCC LOG NO.

16035

College/School: Robert H. Smith School of Business

Please also add College/School Unit Code-First 8 digits: **01202900**

Unit Codes can be found at: https://hypprod.umd.edu/Html_Reports/units.htm

Department/Program: BMGT – Decision, Operations & Information Technologies

Please also add Department/Program Unit Code-Last 7 digits: **1291101**

Type of Action (choose one):

- | | |
|--|--|
| <input type="checkbox"/> Curriculum change (including informal specializations)
<input type="checkbox"/> Curriculum change for an LEP Program
<input type="checkbox"/> <i>Renaming of program or formal Area of Concentration</i>
<input type="checkbox"/> <i>Addition/deletion of formal Area of Concentration</i>
<input type="checkbox"/> <i>Suspend/delete program</i> | <input type="checkbox"/> <i>New academic degree/award program</i>
<input type="checkbox"/> New Professional Studies award iteration
<input type="checkbox"/> New Minor
<input checked="" type="checkbox"/> Request to create an online version of an existing program |
|--|--|

Italics indicate that the proposed program action must be presented to the full University Senate for consideration.

Summary of Proposed Action:

This proposal is for the Robert H. Smith School of Business to offer the existing Master of Science in Business Analytics (MSB) in an online format. The proposed program features both asynchronous materials and synchronous classes online. The MSBA is designed to provide students with an understanding of Business Analytics, and its techniques and methods. In the past decade, Business Analytics has gained enormously in prominence with business and government institutions and entities understanding importance and power in forecasting, prediction and managerial decision making. There is a high demand for managers with Business Analytics skills. The Smith School's strategic plan states the goal of "Growing future leaders to address global issues. UMCP's mission statement sets a goal to "continue to build a strong, university-wide culture of graduate and professional education" and to provide knowledge-based programs and services that are responsive to the needs of the citizens of the state and the nation. We believe an online version of our Master of Science in Business Analytics serves to satisfy these goals by producing future leaders skilled in rigorous quantitative analysis and data based managerial decision making.

Departmental/Unit Contact Person for Proposal: _____

APPROVAL SIGNATURES - *Please print name, sign, and date. Use additional lines for multi-unit programs.*

1. Department Committee Chair _____
2. Department Chair _____
3. College/School PCC Chair _____
4. Dean **Alexander J. Triantis** _____
5. Dean of the Graduate School (if required) _____
6. Chair, Senate PCC *Andrew Harris* *12/2/16*
7. University Senate Chair (if required) _____
8. Senior Vice President and Provost _____

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| <input type="checkbox"/> <i>Addition/deletion of formal Area of Concentration</i> | <input checked="" type="checkbox"/> Request to create an online version of an existing program |
| <input type="checkbox"/> <i>Suspend/delete program</i> | |

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APPROVAL SIGNATURES - Please print name, sign, and date. Use additional lines for multi-unit programs.

- Department Committee Chair Judy K Frels J. Frels 12-9-2016
- Department Chair Henry C. Lucas, Jr. Henry C. Lucas, Jr. 12-9-2016
- College/School PCC Chair Michael Faulkender M. Faulkender 12-9-2016
- Dean Alexander J. Triantis A. J. Triantis 12-9-2016
- Dean of the Graduate School (if required) _____
- Chair, Senate PCC _____
- University Senate Chair (if required) _____
- Senior Vice President and Provost _____
November 2016

**PROPOSAL FOR
NEW INSTRUCTIONAL PROGRAM
UNIVERSITY OF MARYLAND, COLLEGE
PARK**

**Master of Science in Business Analytics
Offered Online on a MOOC Platform
(Massive Open Online Courses)**

ROBERT H. SMITH SCHOOL OF BUSINESS

DEAN ALEXANDER J. TRIANTIS

Master of Science in Business Analytics (MSBA)

Award to be offered January 2018

Master of Science in Business Analytics (MSBA)

I. OVERVIEW AND RATIONALE

A. Briefly describe the nature of the proposed program and explain why the institution should offer it.

Goal and Contribution to the Strategic Plan and Market Demand

The Robert H. Smith proposal for a Master of Science in Business Analytics was approved in 2016 and will be offered at the school's College Park campus in the fall of 2017. This proposal is for an online format for the degree. The proposed program features both synchronous classes and asynchronous materials online. The synchronous component will have weekly class sessions with instructors leading student sections using a video conferencing system that features each participant in a separate real-time window on the screen. Asynchronous material consists of video lectures, simulations, problem sets and similar materials that will be available to registered students on a MOOC platform. This will allow us to simultaneously offer this asynchronous material as not-for-credit Massive Open Online Courses (MOOCs). However, this proposal is for the degree program. Students in the degree program would be completely separate from the students enrolled in the MOOCs.

The degree program consists of ten courses of three credits each. The content of the program is very similar to the already approved MS in Business Analytics that will meet in person in a traditional format. The four required core courses are the same; the main difference is that there are more possible electives that will be offered. These new courses

have been developed after the original proposal and will provide more options for students. (At program launch there will only be six electives; additional electives will be developed over time.)

The strategic plan of the Robert H. Smith School of Business states as its first objective the goal of “Growing future leaders to address global issues.” The University of Maryland, College Park mission statement sets a goal to “continue to build a strong, university-wide culture of graduate and professional education” and to provide knowledge-based programs and services that are responsive to the needs of the citizens of the state and the nation. We believe an online Master of Science Degree offering in Business Analytics serves to satisfy these goals by producing future leaders skilled in rigorous quantitative analysis and data based managerial decision making. Through the online format we will reach a new audience across the nation, and potentially internationally.

A study of trends in higher education has led us to believe that university courses offered in partnership with MOOC providers will be an important component of university education in the future. At the present time, Georgia Institute of Technology offers a MOOC-based MS degree in Computer Science and the University of Illinois offers an MBA utilizing MOOCs in partnership with Coursera. Additional such programs at other universities are in the planning stages.

In the past decade, Business Analytics has made enormous gains in prominence with business and government institutions and entities understanding its importance and power in forecasting, prediction and managerial decision making. There is a high demand for

managers with Business Analytics skills. A McKinsey report on Business Analytics and Big Data states: “The United States alone faces a shortage of 140,000 to 190,000 people with analytical expertise and 1.5 million managers and analysts with the skills to understand and make decisions based on the analysis of big data.” In the past decade, many management professionals with analytics skills have found jobs in a wide range of industries and tasks, including Healthcare Analytics, Fraud Detection, Airline and Transportation Analytics, Operational Analytics, and Purchasing and Procurement Analytics. We anticipate that this demand will grow and continue.

Graduates of the program will have the skills needed to serve for many business analytics and big data related tasks and jobs. Some examples include personnel scheduling (e.g., for hospitals and healthcare organizations, airlines, Transportation Security Administration), data-based disease detection and control, data-mining for fraud detection (e.g., credit card fraud screening for online retailers, claims fraud detection for IRS, selecting audit cases for SEC), data and optimization-based emergency and disaster response (e.g., as employed by FEMA), simulation and optimization based operations planning (e.g., manufacturing, event planning, security screening for transportation), data-mining for Human Resources planning and hiring, optimization-based planning for transportation (e.g., airlines, rail, parcel services), and data and simulation based supply chain and procurement risk management. Notably, the program will aim to train the students for skills and jobs distinctly different than the current MS in Marketing Analytics program offered by the Smith School since the MS in Marketing Analytics program specifically targets marketing tasks and jobs in training and placement.

The Smith School also offers an online version of its Master of Business Administration (MBA), through a partnership with Pearson as a third-party provider of IT and back-end classroom support. The MSBA is a more specialized degree program and will be very different than the MBA degree. The MSBA curriculum is highly oriented towards technical skills in statistics and mathematical and computing applications, and sharply focused on analytics. In contrast, the MBA program aims to give more managerial skills to students and has much less of a focus on in-depth statistical and data analysis knowledge and sophisticated technical applications. The Smith School also offers joint MS-MBA degrees in several fields, and we also seek to offer an option for a joint MSBA- MBA degree. This program is also an ideal path for students who are interested in continuing on to pursue PhD programs in Management Science, Operations Management, and Information Systems.

Graduates from this program will have strong quantitative skills and in-depth knowledge of computational applications and information technology that will position them to meet the increasing need for employees trained in STEM (Science, Technology, Engineering, and Math) disciplines. Modern management professionals and business data analysts increasingly need significant mathematical, statistical and computational knowledge to understand and manage data available to business and government enterprises, and to utilize that understanding in making optimal quantitative decisions using mathematical models. The MSBA program is structured to provide and build not only mathematical and statistical skills such as quantitative modeling, operations management, data mining and simulation, but also technical computational skills such as big data, network and infrastructure management.

II. CURRICULUM

A. Provide a full catalog description of the proposed program, including educational objectives and any areas of concentration.

The Master of Science in Business Analytics (MSBA) degree is a professional degree for students wishing to pursue careers management with a strong quantitative and data analysis training.

The approved MSBA program to be offered by the Robert H. Smith School of Business will provide students with:

- a) comprehensive training in foundations and methodology of quantitative managerial analysis;
- b) comprehensive training in data analysis and data-based managerial decision making;
- c) an in-depth training on methods and tools of contemporary data analytics and big data;
- d) strong background on spreadsheet based modeling and optimization fundamentals and techniques;
- e) good understanding of modern computational data analysis techniques such as data mining, Monte Carlo and discrete event simulation, and network analytics;
- f) strong hands-on training in data handling and data base management;
- g) mastery of the contemporary software used for managerial quantitative and data analysis including web based software and tools.

The online version of the MSBA is designed to meet the same outcomes, with comparable assessment strategies.

B. List the courses (number, title, semester credit hours) that would constitute the

requirements and other components of the proposed program. Provide a catalog description for any courses that will be newly developed or substantially modified for the program.

The online MS BA will be fully online with no residential requirement. The program requires 30 credit hours, with four required core courses (12 credits) and six electives (18 credits total). Once operating at full scale, completion of the degree may be feasible within one year, though many will take two years, and some students may decide to take longer.

The program will be offered in 10-week terms (with 4 terms per year). Each three-credit course will consist of live synchronous video sessions with a faculty member, meeting on average for 90 minutes per week. Courses will be designed to use active learning strategies such as group projects, discussion boards, and simulations, and Smith School faculty will be responsible for regular graded assignments and office hours. Students will be expected to supplement and prepare for their synchronous sessions with asynchronous online learning material consisting of readings, recorded video with short in-video quizzes, longer stand-alone quizzes. Some of the supplementary material may include auto-graded and possibly peer-graded assignments. In total, students are expected to spend ten to twelve hours per week per course over the ten week term.

Students will be provided with a clear path for program completion at the beginning of their engagement with the Smith School. Academic advising on demand is available to all students via phone calls with appropriately trained staff advisors and the academic director of the program as needed. In addition, the Smith School has processes for tracking the

academic progress of students and contacting those students who are not making sufficient progress (e.g., GPA below 3.0) for proactive advising.

Students will be onboarded through a series of “welcome webinars” conducted by staff. These webinars teach students about how to use the technology through which the program will be delivered (for example, for the Online MBA we train students on Adobe Connect and Canvas, the two primary tools we use to conduct our classes.)

Faculty will be trained and sensitized that online students need rapid response through multiple mechanisms that include email, discussion boards, and office hours, in addition to weekly synchronous sessions where students can engage faculty directly.

Required Courses

Course descriptions are provided below. The four core courses are the same as those envisioned for the approved in-person MS BA offering; online versions will be developed.

BUSI 630 Data, Models, and Decisions (3): Introduces students to analytical techniques that establish the optimality of managerial decisions via empirical (“data models”) and logical (“decisions”) means. The course may be viewed as consisting of two integrated parts. In the first part, various methods of analyzing data, including regression analysis are studied. The second part covers models for making optimal decisions in situations characterized by either an absence of uncertainty or where the uncertainty arises from non-competitive sources.

BUDT 732 Decision Analytics (3): This course explores basic analytical principles that can guide a manager in making complex decisions. It focuses on two advanced analytics techniques: optimization, dealing with design and operating decisions for complex systems, and simulation, dealing with the analysis of operating decisions of complex systems in an uncertain environment. The course provides students with a collection of optimization and simulation modeling and solution tools that can be useful in a variety of industries and functions. The main topics covered are linear, integer, and nonlinear optimization applications in a wide variety of industry segments, and Monte-Carlo Simulation and risk assessment. Application-oriented cases are used for developing modeling and analytical skills, and to simulate decision-making in a real-world environment.

BUDT 733 Data Analytics (3): Increasingly, governments and businesses are collecting more and more data. Examples include the Internet, point-of-sale devices, medical databases, search engines, and social networks. The increased data availability coupled with cheap computing power provides us with an unprecedented opportunity to use sophisticated data-driven mathematical models to achieve many important goals and/or gain a competitive edge. This course gives an overview of the data-mining process, from data collection, through data modeling and analytical algorithms, to data-driven decision making. The focus is on introducing data-mining algorithms such as logistic regression, classification trees and clustering, and their application to real-world data, as well as introducing some of the more recent developments in the field such as ensemble methods.

BUDT 704 Database Management Systems (3): Provides fundamental concepts and skills

necessary for designing, building, and managing business applications which incorporate database management systems as their foundation. Topics covered include the fundamentals of database management (DBMS) technology, alternative methods for modeling organizational data, the application of delivering data through Web-based and other graphical interfaces. Non- majors should review their registration eligibility in the statement preceding the BUDT courses.

Elective Courses

The elective courses will be offered in a manner that will allow students to focus in one particular area (for a depth of knowledge), to take a set of courses that will allow them to broaden their knowledge, or a combination of both.

BUDT 758 Computer Simulation and Analytics (3): This course covers the basic techniques for computer simulation modeling and analysis of discrete-event systems. Course emphasis is on conceptualizing abstract models of real-world systems (for example, inventory and queuing systems), implementing simulations in special purpose software, planning simulation studies, and analyzing simulation output. Some mathematical theory will be covered.

BUDT 706 Social Media and Web Analytics (3): Over the past years, social computing technologies such as online communities, blogs, wikis, and social networking systems have become important tools for individuals to seek information, socialize with others, get support, collaborate on work, and express themselves. Increasingly, businesses are trying to

leverage web 2.0 by using social computing technologies to communicate with customers, employees, and other business partners or to build new business models. This course will review concepts and principles related to web 2.0 and examine issues and strategies associated with business use of social computing technologies.

BUDT 758 Big Data: Strategy, Management and Applications (3): Digitization is occurring in every aspect of business and our daily lives, generating a huge amount of data. Big data represents unprecedented opportunities for companies to generate insights to improve products and services and contribute to the bottom line. At the same time, much of the big data is unstructured, in real time and only loosely connected. It defies the traditional ways of managing databases. This creates challenges even to tech-savvy companies on how to leverage the big data to gain competitive advantage. This course provides cutting edge knowledge about various aspects of big data, including: how to identify strategic values of big data, major types of big data, methods to capture and store big data, analytical tools for big data, and pitfalls to avoid in formulating a big data strategy. In the end of the course, students will have a comprehensive understanding of important business issues related to big data, and be able to successfully design and implement big data strategy.

BUDT 758 Google Online Challenge Analytics (3): This course is a hands-on learning-by-doing course. Students will design, develop, and implement sponsored search strategies for real-world clients are part of the Google Online Challenge. Students will work in teams of 4 or 5, spend real advertising dollars to run a sponsored-search advertising campaign for their client. In conjunction with the client, students will also develop digital and social media

strategies that complement and support their sponsored search advertising campaigns on Google. The teams will also learn to use analytical tools to analyze the performance of their campaigns and provide guidelines to the client for future campaigns. This “real-time, real-business, real-money” challenge provides a valuable opportunity for students to gain a first-hand experience with online advertising and benefit from the immediate campaign performance feedback. At the end of this course, a student should feel comfortable developing and implementing digital strategies and executing online campaigns for firms. They should know all the key terminology and theories of the field and have a good idea of how things work below the surface.

BUDT 758 Healthcare Analytics (3): This class will focus on some of the key aspects of conducting analysis and applying the results in the health care system. The course will a) discuss the business of health care, payment systems and insurance b) discuss health care data, privacy and HIPAA, and c) explore successful implementations of analytics in healthcare settings. Various applications of healthcare analytics will be discussed, focusing on costs, operations, quality, equity, and access.

BUDT 758 Marketing Analytics (3): This class presents basic marketing theory to help students understand key concepts and issues in marketing. The availability of purchase information on the Internet provides “big data” for a variety of marketing studies. The course explores the kinds of data available, the issues in collecting the data, privacy concerns and approaches to analyzing data to inform marketing decisions.

BUDT 758 Financial Analytics (3): The class begins with an overview of corporate finance and financial markets. Students learn about the large number of financial databases available to provide data for analysis. Computational techniques for financial analytics are presented drawing on prior coursework on econometrics and modeling.

BUDT 758 Operations Analytics (3): This course explores analytical methods, tools and strategies that can enable firms to achieve effective and sustainable operations. The course covers a mix of qualitative and quantitative problems and issues confronting operations managers. The first part of the course focuses on analytics that measure the performances of business operations, explaining how to measure key process parameters like capacity and lead time and analyze the impact of variability on business processes. The second part of the course focuses on analytics that improve the performances of business operations, examining analytics in quality management as well as recent moves toward lean operations. The course also includes a module on inventory analytics with applications in pricing and revenue management. Throughout the course various operations analytics applied to real operational challenges are illustrated. The aim is to provide both tactical knowledge and high-level insights of operations analytics needed by general managers and management consultants. It is also demonstrated how companies can use operational principles from to significantly enhance their competitiveness.

B. Scheduling Considerations

Below is a tentative schedule for offering the courses during four 10-week terms per year. If a student elects to take one course per term it will take 2.5 years to complete the degree. By taking more than one course at a time the student can accelerate and reduce the time to graduation.

Year 1				Year 2				Year 3				Year 4..n			
Term 1-1	Term 1-2	Term 1-3	Term 1-4	Term 2-1	Term 2-2	Term 2-3	Term 2-4	Term 3-1	Term 3-2	Term 3-3	Term 3-4	Term n-1	Term n-2	Term n-3	Term n-4
630	732	733	704	630	732	733	704	630	732	733	704	630	732	733	704
		630	732	733	704	630	732	733	704	630	732	733	704	630	732
				Big Data	Marketing A	Web A	OpsA	Health A	Finance A	Big Data	Marketing A	Web A	OpsA	Health A	Finance A
						Big Data	Marketing A	Web A	OpsA	Health A	Finance A	Big Data	Marketing A	Web A	OpsA

Year 1				Year 2				Year 3			
Term 1-1	Term 1-2	Term 1-3	Term 1-4	Term 2-1	Term 2-2	Term 2-3	Term 2-4	Term 3-1	Term 3-2	Term 3-3	Term 3-4
630	732	733	704	Big Data	Marketing A	Web A	OpsA	Health A	Finance A		
		630	732	733	704	Big Data	Marketing A	Web A	OpsA	Health A	Finance A
				630	732	733	704	Big Data	Marketing A	Web A	OpsA
						630	732	733	704	Big Data	Marketing A
								630	732	733	704
										630	732

C. Describe any selective admissions policy or special criteria for students selecting this field of study.

Applicants to the MSBA program must have completed all of the requirements for a baccalaureate degree prior to their acceptance into the program, with particular emphasis

on the student having strong quantitative background. Recent graduates in quantitative and mathematical fields such as engineering, computer science, mathematics, statistics, physics and physical sciences are ideally suited for the program. All applicants must submit: a) transcripts from all undergraduate and graduate institutions attended; b) official Graduate Record Examination (GRE) scores or the Graduate Management Admissions Test (GMAT) scores; c) a complete online application form that includes a written essay articulating qualifications and motivation for pursuing advanced education as well as their CV (resume); and d) one letter of recommendation from supervisors or from professors competent to judge the applicant's probability of success in graduate school.

Another standardized test in lieu of the GRE or GMAT can be substituted at the discretion of the Academic Director. At the discretion of the faculty, the standardized test may be waived depending upon the strength of the applicant's quantitative ability as demonstrated by professional work experience, previous undergraduate or graduate coursework or special certifications held.

In addition, at the discretion of the faculty, additional information may be requested from the applicant in the form of either a personal video response submission or evaluative interview conducted via in-person or video teleconference. Proof of English language proficiency (TOEFL or IELTS official scores) is also required unless the applicant has received an undergraduate or graduate degree from a select list of countries. Note that because this is an online program of study, it is not eligible for F-1 or J-1 visa issuance.

In addition to Graduate School requirements, admission decisions for the MSBA program

will be based on the quality of previous undergraduate and graduate coursework (if applicable), the strength of Graduate Record Examination scores, the Graduate Management Admissions Test scores, or another standardized test, the relevance of prior work and research experience, and the congruence of professional goals with those of the program. We anticipate an enrollment of 75 students per cohort as we launch the program but we have the ability to accept a lower total in the first year as we begin to market the program. Ultimately we would like to expand the cohort size to 250 but will only do so if we can attract highly qualified students.

III. STUDENT LEARNING OUTCOMES AND ASSESSMENT

The learning outcomes for the MSBA will be the same as the already approved face to face program (http://www.provost.umd.edu/ProgDocs/15-16/15038_BMGT_AddMSBusinessAnalytics.pdf). They are provided below. As the learning outcomes for the face to face program are updated, the outcomes for the online version will be as well.

List the program's learning outcomes and explain how they will be measured.

Learning Outcome 1: Students will identify and apply the fundamental concepts of Statistics, Data Analysis, Quantitative Modeling, Simulation, and Optimization to solve novel problems.

Measure: Students will be required to pass a set of classes in each of these areas.

Criterion: At least 90% of students will receive a rating of "Satisfactory" or better

from the Academic Director, who will review their performance in the core classes. The Academic Director will meet with students rated below “Satisfactory” to help improve their performance or determine their continued participation in the program. In addition, students must maintain a 3.0 GPA to remain in good academic standing. Failure to maintain a 3.0 jeopardizes continued enrollment in the program.

Assessment: Every Year, starting in 2018.

Learning Outcome 2: Students will demonstrate proficiency in applying the practical tools and techniques of modern Business Analytics to solve complex business problems.

Measure: Students must take and succeed in classes that teach the practical techniques of Business Analytics and their implementation with contemporary software applications

Criterion: At least 90% of students will receive a rating of “Satisfactory” or better from the course instructor.

Assessment: Every Year, starting in 2018.

Learning Outcome 3: Students will produce professional quality presentations.

Measure: All students must take the required courses that will include oral class presentations to test these skills.

Criterion: At least 90% of students will receive a rating of “Satisfactory” or better from the course instructor.

Assessment: Every Year, starting in 2018.

Learning Outcome 4: Students will demonstrate their ability to foster a constructive

team climate and effectively contribute to team effort.

Measure: Students will conduct peer evaluations of their group member's participation in group projects as part of a class.

Criterion: At least 90% of students will receive a rating of "Satisfactory" or better from their peer evaluations.

Assessment: Every Year, starting in 2018.

Similar rubrics will be used to measure learning outcomes across the online and the face-to-face program to ensure that Further, this program will adhere to the standards of academic integrity set forth by the University of Maryland, College Park Office of Student Conduct. Several tools (such as ProctorU and Examity) exist to validate the identity of course participants and help enforce the integrity of assessment. The budget for this program contains sufficient resources to adopt such a tool.

The student experience will be assessed through multiple methods:

- The recruiting and onboarding experience will be assessed through a survey administered to newly enrolled students, twice per year.
- Each course will be assessed through the Smith School's course evaluation process.
- At least once a year, the program administration will field a student satisfaction survey and hold meetings (online) with student representatives.
- The academic director may choose to meet regularly with students to gain feedback on the program overall.

IV. FACULTY AND ORGANIZATION

A. Who will provide academic direction and oversight for the program? [This might be a department, a departmental subgroup, a list of faculty members, or some other defined group.]

Primary oversight of this program will be provided by a faculty member assigned as the academic director of the program. Program oversight would also include the chair of the Decision, Operations, and Information Technologies Area (DOIT), a DOIT area oversight committee, and the Dean's office.

The DOIT area of the Robert H. Smith School of Business currently has 32 FTE faculty; 22 of these are tenure/tenure track and nine are teaching faculty (full-time lecturers). These 32 full-time equivalent faculty have doctoral degrees in operations management, management science, statistics, information systems, or business. In addition, there are several adjunct instructors currently employed by the department.

DOIT Faculty Expected to Teach in the Proposed MSBA Program

Ritu Agarwal, Ph.D., Professor & Robert H. Smith Dean's Chair of Information Systems

Teaching/research focus: Management of Information Systems, Health Care

Information Systems Courses: To be determined

Pamela K. Armstrong, Ph.D., Clinical Associate Professor of Management Science

Teaching/research focus: Service operations, quality, and performance

management

Courses: BUDT 732 Decision Analytics (3), BUDT 758 Operations Analytics (3)

Michael O. Ball, Ph.D., Senior Associate Dean & Dean's Chair in Management Science

Teaching/research focus: Network optimization and integer programming particularly as applied to problems in transportation systems and supply chain management.

Courses: BUDT 758 Pricing and Revenue Management (3)

Sean Barnes, PhD, Assistant Professor of Operations Management

Teaching/research focus: Modeling, simulation, and complex systems

Courses: BUDT 630 Data, Models, and Decisions (3), BUDT 758 Computer Simulation for Business Applications (3) BUDT 758 Healthcare Analytics (3)

Margret Bjarnadottir, Ph.D., Assistant Professor of Management Science and Statistics

Teaching/research focus: Operations research methods using large scale data

Courses: BUDT 733 Data Analytics (3)

Zhi-Long Chen, PhD, Professor of Operations Management

Teaching/research focus: optimization, logistics, scheduling, supply chain management, and operations management

Courses: BUDT 758 Operations Analytics (3), BUDT 758 Capstone Project in

Operations Analytics (3)

Wedad J. Elmaghraby, Ph.D., Associate Professor of Management Science & Operations
Management

Teaching/research focus: Design of competitive procurement auctions in
business-to-business markets and pricing in markets where buyers behave
strategically

Courses: BUDT 758 Operations Analytics (3)

Gordon Gao, Ph.D., Associate Professor of Information Systems

Teaching/research focus: IT's impact on Health care and innovation, and
transparency in service quality

Courses: BUDT 758 Big Data: Strategy, Management, and Applications (3), BUDT
758 Healthcare Analytics (3)

Bruce Golden, Ph.D., Frank Merrick Chair in Management Science

Teaching/research focus: Heuristic search, combinatorial optimization, networks,
and applied operations research; Healthcare Operations.

Courses: BUDT 758 Healthcare Analytics (3)

Il-Horn Hann, Ph. D., Associate Professor & Co-Director of DIGITS

Teaching/research focus: Price competition in electronic markets, Pricing in

Name-Your-Own-Price markets, online privacy, open-source software.

Courses: BUDT 706 Social Media and Web Analytics (3) BUDT 758 Google Online
Challenge Analytics (3)

Sunil Mithas, Ph.D., Professor of Information Systems

Teaching/research focus: Strategies for managing innovation and excellence for corporate transformation, focusing on the role of technology and other intangibles, such as customer satisfaction, human capital, and organizational capabilities.

Course: BUDT 706 Social Media and Web Analytics (3)

Kislaya Prasad, PhD, Director, Center for International Business Education and Research, and Research Professor

Teaching/research focus: Computability and complexity of individual decisions and economic equilibrium, innovation and diffusion of technology, and social influences on economic behavior

Courses: BUDT 630 Data, Models, and Decisions (3), BUDT 733 Data Analytics (3)

Louiqa Raschid, PhD, Professor of Information Systems

Teaching/research focus: Solving the challenges of data management, data integration, and performance for applications in the life sciences, Web data delivery, health information, financial information systems, humanitarian IT

applications and Grid computing

Course: BUDT 704 Database Management (3)

Siva Viswanathan, PhD, Associate Professor of Information Systems and Co-director of DIGITS

Teaching/research focus: emerging issues related to online firms and markets, and on analyzing the competitive and strategic implications of new information and communication technologies

Courses: BUDT 706 Social Media and Web Analytics (3) BUDT 758 Google Online Challenge Analytics (3)

Yi Xu, PhD, Associate Professor of Operations Management

Teaching/research focus: Product assortment optimization, pricing, innovation and new product development, supply chain management, and Marketing and Operations Interface

Courses: BUDT 758 Pricing and Revenue Management (3) BUDT 758 Operations Analytics (3), BUDT 758 Capstone Project in Operations Analytics (3)

In addition to faculty from the DOIT area, Smith School faculty from areas such as Finance and Marketing are also expected to contribute to the teaching of this program. Faculty from other areas of the Smith School anticipated to possibly teach in this proposed program include:

Michael Faulkender, PhD, Associate Professor of Finance and Director of Master of

Finance Program

Teaching / research focus: Empirical Corporate Finance

Course: Financial Analytics

Rosellina Ferraro, PhD, Associate Professor of Marketing and Associate Chair

Teaching / research focus: Marketing Consumer Behavior

Course: Marketing Analytics

Judy Frels, PhD, Clinical Professor of Marketing and Assistant Dean of Online Programs

Teaching / research focus: Marketing

Course: Marketing Analytics

Richmond Mathews, PhD, Associate Professor of Finance

Teaching / research focus: Theoretical Corporate Finance

Course: Financial Analytics

Alberto Rossi, PhD, Assistant Professor of Finance

Teaching / research focus: Financial Econometrics

Course: Financial Analytics

Michael Trusov, PhD, Associate Professor of Marketing

Teaching / research focus: Internet marketing

Course: Marketing Analytics

Michel Wedel, PhD, Distinguished University Professor

Teaching / research focus: Consumer Science

Course: Marketing Analytics

Liu Yang, PhD, Associate Professor of Finance

Teaching / research focus: Empirical Corporate Finance

Course: Financial Analytics

B. If the program is not to be housed and administered within a single academic unit, provide details of its administrative structure.

Not applicable. All classes will be housed and administered within the Robert H. Smith School of Business.

V. OFF CAMPUS PROGRAMS

A. If the program is to be offered to students at an off-campus location, with instructors in classrooms and/or via distance education modalities, indicate how student access to the full range of services (including advising, financial aid, and career services) and facilities (including library and information facilities, and computer and laboratory facilities if needed) will be assured.

All courses are planned to be offered online.

B. If the program is to be offered mostly or completely via distance education, you must describe in detail how the concerns in Principles and Guidelines for Online Programs are to be addressed.

Principles and Guidelines for Online Programs

Our guiding principles in the development of these programs must be the maintenance of academic integrity and of program quality. The programs we offer must be consistent with our mission and must reflect our particular strengths, not simply be opportunities for profit.

They must be developed by, be under the academic control of, and largely be taught by our regular faculty. Only fully qualified students should be admitted, and they should be offered programs that match in depth, breadth, and quality of instruction those offered to traditional on-campus students. The design of programs and their delivery mechanisms, as well as the provision of supporting services, should allow educational outcomes fully consistent with those for on-campus programs.

The courses will be developed by full-time, Ph.D. faculty in the Business School. Admissions standards will be the same as for other MS programs in the Smith School. The academic rigor and content of the program is to be equivalent to the traditional in person MS in Business Analytics.

A number of educational associations (including the Middle States Association and the American Council on Education) have provided guidelines for distance learning programs, and the MHEC has now required that institutions offering distance education within Maryland comply with its [Standards for Instruction Delivered by Distance Education](#). These guidelines and standards reach a consensus on what the critical issues are, and form the basis for the rules and procedures set out below.

Issues identified in the several sets of guidelines include appropriate choice of programs to be offered; faculty control of the curriculum and its presentation; the appropriate training and continuing support of faculty; student access to library and other learning resources; student access to technical support and bookstores, and to student services including advising, financial aid, bursar services, and career services; availability of appropriate facilities for course development; truth in advertising; and intellectual property rights. All proposals to offer a program in this manner must fully address all these issues, as described below. In some cases,

the Office of Continuing and Extended Education (OCEE) can offer services that will facilitate addressing the issues, but use of these services is never required.

This program will adhere to the standards of academic integrity set forth by the University of Maryland, College Park Office of Student Conduct. Several tools exist to validate the identity of course participants and help enforce the integrity of assessment. The budget for this program contains sufficient resources to adopt such a tool.

- 1. Program Initiation and Choice: The proposal should initiate with an academic unit, and must have the approval of the appropriate Dean (or Deans). It must develop naturally from the institution's strengths and be consistent with its strategic goals. The proposal should have a clear and well-thought-out financial plan, providing net revenue to the institution over time, and should include a thorough analysis of the potential market.** The program originated with the DO&IT Department in the Business School and has been approved by the department chair, the appropriate curriculum committees and the deans. As outlined above the school has great strengths in the area of business analytics; the proposed program is consistent with the strategic plan of the department, school and university. Coursera, our proposed partner, has surveyed a sample of 15,000 of its 22 million plus learners and business analytics is in the top two programs the students would like to have available as an MS degree from a highly ranked university.
- 2. Program Development, Control, and Implementation by Faculty: Although professional help may be used in adapting it to the online medium, the academic**

content of the curriculum must be developed by institutional faculty. The instructional strategy proposed must be appropriate for this content. UMCP faculty must have overall control of the program, and should provide the bulk of the instruction. Appropriate resources, including technical support personnel, must be made available for course development and also for faculty support during the offering of these courses. The business plan for the proposal must spell out the arrangements whereby this will be accomplished. The faculty of the business school will develop the curriculum. Note that most of the courses in the MS program exist already. They will be converted to an online environment with the asynchronous components structured as MOOCs. The budget for the program includes instructional designers, videographers and individuals do work on post-production preparation of videos.

3. **Access to Academic Resources and Student Services:** The proposal must indicate how students will have access to needed resources, such as library materials, other information sources, laboratory facilities, and others as appropriate. The arrangements in place for interaction with instructors, for advising, and for help with technical problems must be described. It must be shown how student services such as admissions, enrollment, financial aid, bursar services, career advisement, bookstore, and similar services available to on-campus students will be provided. The Smith School has a successful online MBA program and will utilize its experience with this program to provide student services such as academic advising and access to the bursar. In the first few years of the program there will be

no financial aid. We also are not planning to provide any placement services. Smith may partner with MOOC providers as described below to market the program and assist in providing non-academic student support. Access to needed library resources are readily available online as are statistical software packages. Students in both the Online MBA and the Part-time MBA (in Baltimore, Shady Grove and Washington, D.C.,) offered by Smith currently access all of these resources remotely.

- 4. Intellectual Property Rights: The proposal must clearly delineate ownership and usage rights for materials that may be developed for courses in the program.**

Intellectual property rights will adhere to UMD guidelines for online courses and programs.

- 5. Full Disclosure, Standards, and Evaluation: All published materials describing the program must carefully lay out the instructional methods to be used, the skills and background required for success, and the arrangements in place for access to instructors, to technical help, to academic resources, and to student services. There should be a means available whereby potential students can evaluate their readiness for the special demands of the program. Academic admission standards must be clearly described, and must be consistent with those for the on-campus program. Outcome expectations must also be consistent. The proposal must set out a continuing process of evaluation that will determine if these requirements are being met.** There will be a faculty member designated as Academic Director and a staff member who will be the Director of Operations. These two individuals will review all materials and see that the requirements of the paragraph above are met.

The Smith School has an Assurance of Learning Program as required by its accrediting agency, the AACSB; any MS program will be a part of this program. It assures that outcomes are measured across courses in the program and the results fed back at the program level to maintain and improve quality.

MHEC Standards for Instruction Delivered by Distance Education

[COMAR 13b.02.02.16.O\(2\)](#): An institution delivering instruction in Maryland by distance education shall provide evidence to the Secretary of compliance with the standards of good practice in this section. Standards of good practice for distance education:

A. Curriculum and Instruction.

- 1. A program of study shall be developed by a team of faculty, administrators, and technologists.**
- 2. A program of study shall result in learning outcomes appropriate to the rigor and breadth of the degree program offered.**
- 3. A degree program delivered by distance education shall be coherent and complete.**
- 4. A program shall provide for appropriate real-time or delayed interaction between faculty and students.**
- 5. Qualified faculty shall provide appropriate oversight of the program offered.**
- 6. Faculty members in appropriate disciplines shall participate in the design and planning of programs and courses to be delivered by distance learning.**

Earlier parts of this proposal address these requirements. The faculty will guide the development of the curriculum with help from instructional designers and other staff members. There will be an Academic Director and a Director of Operations. The proposal is for a complete MS program and features synchronous video classes with qualified instructors. The Assurance of Learning Program involves all of the faculty. The business school faculty has the expertise in business analytics to offer the program.

B. Role and Mission.

- 1. The program shall be consistent with the institution's mission.**
- 2. Review and approval processes shall ensure the appropriateness of the technology being used to meet the program's objectives.**

Please see the introduction: this program is highly consistent with the mission of the department, business school and university. The MS in BA online is at the leading edge of higher education and will be a model for other offerings at UMD. The University will provide a videoconferencing system that allows for faculty student interaction in real time. Further, should the business school partner with a MOOC provider those platforms are continually being upgraded with the latest technology.

C. Faculty Support.

- 1. Principles of good practice for teaching in a distance learning format shall be developed and maintained by the faculty.**

2. **The program shall provide faculty support services specifically related to teaching by distance education.**
3. **The program shall provide training for faculty who use technology in instruction.**

The Smith School faculty is already familiar with distance learning through its successful online MBA program. The school will hire appropriate instructional designers, videographers and post production personnel who will be dedicated to the MS in Business Analytics. Instructional designers will consult with faculty on the best practices in distance education. Faculty will be trained on best pedagogical practices in an online setting and on the technology used to deliver the program.

D. Resources for Learning. The program shall ensure that appropriate learning resources are available to students.

E. Students and Student Services.

1. **The program shall provide students with clear, complete, and timely information on the curriculum, course and degree requirements, nature of faculty/student interaction, assumptions about technology competence and skills, technical equipment requirements, availability of academic support services and financial aid resources, and costs and payment policies.**
2. **Enrolled students shall have reasonable and adequate access to the range of student services to support their learning.**
3. **Accepted students shall have the background, knowledge, and technical skills needed to undertake the program.**

- 4. Advertising, recruiting, and admissions materials shall clearly and accurately represent the program and the services available.**

The Academic Director and the Director of Operations are charged with insuring the requirements above are met. We will apply the same admissions criteria to the online as to the on-campus MS program.

F. Commitment to Support.

- 1. Policies for faculty evaluation shall include appropriate consideration of teaching and scholarly activities related to programs offered through distance learning.**
- 2. The institution shall demonstrate a commitment to ongoing support, both financial and technical, and to a continuation of the program for a period sufficient to enable students to complete a degree/certificate.**

The Provost at UMD has agreed to fund the development of the program for the first three years after which it should be self-sustaining. Surveys of market demand from Coursera, a potential partner, provide assurance that there will be enough students for the program to be viable for a minimum of five years.

G. Evaluation and Assessment.

- 1. The Institution shall evaluate the program's educational effectiveness, including assessments of student learning outcomes, student retention, student and faculty satisfaction, and cost effectiveness.**

2. The Institution shall provide for assessment and documentation of student achievement in each course and at the completion of the program.

The Smith School Assurance of Learning Program should meet the two requirements above. Each course is evaluated separately and the results are pooled to provide feedback at the program level. Students complete evaluations of individual courses and section instructors for interactive video classes.

VI. OTHER ISSUES

A. Describe any cooperative arrangements with other institutions or organizations that will be important for the success of this program.

We are currently negotiating with MOOC platform providers. While Coursera is the likely provider, we are also investigating EdX as an alternative. In either case, we will maintain full ownership of the intellectual property of all course materials. A term-limited exclusive relationship with the platform provider is a possibility, and is being negotiated.

In any case, UMD will maintain 100% control over the academic design and offering of the program including admissions.

Finally, any academic technology vendor that we partner with will be analyzed and approved to meet the UMD's privacy, security and legal requirements. We will work with the Division of Information Technology and the Registrar to ensure FERPA compliance in managing privacy of student records and security to ensure that only authorized access to student records is possible. We will work with UMD's office of general counsel to ensure that

the terms of service are acceptable as well.

All academic aspects of the program from admissions to academic programming will be controlled by the Robert H. Smith School of Business.

B. Will the program require or seek accreditation? Is it intended to provide certification or licensure for its graduates? Are there academic or administrative constraints as a consequence?

The University of Maryland's Robert H. Smith School of Business is already accredited by the AACSB (American Association of Collegiate Schools of Business). No additional accreditation is sought for this individual program.

VII. COMMITMENT TO DIVERSITY

Identify specific actions and strategies that will be utilized to recruit and retain a diverse student body.

The Robert H. Smith School of Business community is multifaceted at every level – students, staff and faculty represent the spectrum of diversity. With a large population of international students and a diverse blend of backgrounds, nationalities, ethnicities and experiences, Smith students have an opportunity to make connections with those who share their interests, and to grow and learn by making new friends and sharing new experiences. Coursera will market the program and screen applicants, forwarding qualified applicants to the Smith School for an admissions decision. Coursera currently reaches 22 million learners world-wide so we expect a rich and highly diverse group of students to enroll in the MS program. The School engages in recruiting and outreach

events across the globe to generate a diverse student body.

VIII. REQUIRED PHYSICAL RESOURCES

A. Additional library and other information resources required to support the proposed program. You must include a formal evaluation by Library staff.

No additional library resources will be needed.

B. Additional facilities, facility modifications, and equipment that will be required. This is to include faculty and staff office space, laboratories, special classrooms, computers, etc.

The program is online. There will be a need for a few offices for staff support personnel.

C. Impact, if any, on the use of existing facilities and equipment. Examples are laboratories, computer labs, specially equipped classrooms, and access to computer servers.

None

IX. RESOURCE NEEDS AND SOURCES

Describe the resources that are required to offer this program, and the source of these resources. Project this for five years. In particular:

A. List new courses to be taught and needed additional sections of existing courses.

Describe the anticipated advising and administrative loads. Indicate the personnel resources (faculty, staff, and teaching assistants) that will be needed to cover all these

responsibilities.

New courses that will be designed for the MS in Analytics Program are: BUDT 758 Healthcare Analytics (3), BUDT 758 Operations Analytics (3), BUDT 758 Marketing Analytics (3), and BUDT 758 Financial Analytics (3).

The new program will need two sections per year on average for each of these courses. Required and elective courses can be mostly shared with other programs. Overall we expect on average an additional load of 18-21 credits per year to be generated by the new program. This will also bring an additional 18-21 credit hour grading assistance by GAs.

Because the program is online there will be limited advising. Any partner in the program (such as Coursera) will be required to provide some advising for applicants and for the use of their platform. The Academic Director and Operations Director at Smith will provide advising on curriculum issues.

B. List new faculty, staff and teaching assistants needed for the responsibilities in A, and indicate the source of the resources for hiring them.

Two new tenure track faculty in DOIT will be needed to cover additional 18 credits. One part time administrative support staff may be needed to be hired. The investment by the provost as well as the additional tuition revenue generated by the online MS in Business Analytics program are expected to be used to cover the costs for these hires.

C. Some of these teaching, advising, and administrative duties may be covered by existing faculty and staff.

Describe your expectations for this, and indicate how the current duties of these individuals will be covered, and the source of any needed resources.

Some of the expected 30 credit teaching load per year increase can be covered by existing faculty teaching in other programs. As described above, we expect our partner to provide student advising in consultation with Smith School program administrators.

D. Identify the source to pay for the required physical resources identified in Section VIII above.

Funds from the Provost as well as additional tuition generated by the online MS in Business Analytics students are expected to cover these costs.

E. List any other required resources and the anticipated source for them.

There are no other required resources expected at this point.

F. Provide the information requested about peer programs.

See Appendices 1, 2 and 3.

Conclusion about peer Business Analytics Masters programs

Most peer programs appear to offer similar curriculum as proposed in this document, but none is offered online using MOOCs for the asynchronous course materials. Some programs tend to have a stronger focus on theory and less of practically applicable skills. Our proposed program balances between these two dimensions assuring students who complete the program will have the necessary hands on skills sought after by the employers. Regarding other classroom-based programs in Maryland that contain some similar content on data

analytics, the online MS in Marketing Analytics program offered by the Smith School is different in orientation and content, as detailed earlier in this proposal. The College of Information Studies at the University of Maryland has a Masters in Information Management program with a Data Analytics specialization. Appendix 1 details the differences between this program and our proposed MS in Business Analytics program.

Appendix 1: Peer Comparisons - Comparison of the proposed Smith School Master of Science in Business Analytics Program (MSBA) and the University of Maryland iSchool's Master of Information Management (MIM) Program's Data Analytics specialization

The following is a list of courses from the iSchool's webpage on their Masters of Information Management (MIM) program, Data Analytics specialization (one of the eight specializations offered in the MIM program):

- **Four Core courses (12 cr.)** [Required of all MIM students]
 - INFM 600 Information Environments
 - INFM 603 Information Technology and Organizational Context
 - INFM 605 Users and Use Context
 - INFM 612 Management of Information Programs and Services
- **Two Project courses (6 cr.)** [Required of all MIM students]
 - INFM 736 Information Management Experience
 - INFM 737 Information Management Capstone Experience
- **Three Core Specialization Courses (9 cr.)** [Required for MIM Data Analytics students]
 - INST 733 Database Design
 - INST 627 Data Analytics for Information Professionals
 - INST 737 Digging into Data: Data Mining, Machine Learning & Advanced Analytics
- **Two Specialization Electives (6 cr.)**
 - INST 633 Analyzing Social Networks and Social Media
 - INFM 714 Principles of Competitive Intelligence
 - INFM 732 Information Audits and Environmental Scans
 - INFM 747 Web-Enabled Databases
 - INFM 750 From Data to Insights
 - INST 714 Information for Decision Making
 - INST 760 Data Visualization
 - INST 767 Big Data Infrastructure
 - INST 728Q Visual Analytics
 - INST 728R Data Management
 - INST 728T Analyzing Social Networks in Times of Crisis (1 credit)
- **One General Elective (3 cr.)**

Below is a list of currently proposed courses for MS in Business Analytics (MSBA) Program:

- **Four Required Courses (12 credits)**
 - BUSI 630 Data, Models, and Decisions

- BUDT 732 Decision Analytics
- BUDT 733 Data Analytics
- BUDT 704 Database Management Systems
- **Six Electives from the following (18 credits)**
 - BUDT 758 Computer Simulation for Business Applications
 - BUDT 706 Social Media and Web Analytics
 - BUDT 758 Big Data: Strategy, Management and Applications
 - BUDT 758 Price Optimization and Revenue Management
 - BUDT 758 Healthcare Analytics
 - BUDT 758 Marketing Analytics
 - BUDT 758 Operations Analytics
 - BUDT 758 Financial Analytics
 - BUDT 758 Capstone Project in Operations Analytics

The descriptions for these courses are given in the MSBA proposal. The differences in the designs and clientele for the two programs are described below:

- 1- **Curriculum differences:** The proposed Smith School Master of Science in Business Analytics program is focused on business strategic and operations applications of data analytics, such as operations management, operations research, applied simulation analysis, price and revenue management, and healthcare analytics. In contrast, the Masters in Information Management specialization in Data Analytics also provides distinct courses in the area of information management, including data visualization, information audits, web-enabled databases, big data infrastructure, management of information programs and services, information environments, and both user and organizational contexts of IT. There are naturally common elements to both programs, including fundamental topics related to statistical analysis, data mining, social media analytics and strategy, database design, decision making and models, and data management.
- 2- **Differences in Target Student Population and Placement:** The graduates of the MSBA program will be primarily interested in positions as business analysts, business consultants, operations managers, revenue managers, healthcare management consultants and supply chain managers, where they would apply their skills in optimization, simulation, decision modeling, data mining, pricing, and analytics- based business strategy. Graduates of the MIM Data Analytics specialization take positions as data analysts, information analysts, data scientists, consultants, and project managers in a broader set of organizations, including businesses, government agencies, universities, non-profits, and multi-lateral organizations, leveraging their deep knowledge in information management, analytics, and information technology.

Appendix 2: Peer Comparisons - MBA Ranked Peer Schools Offering MS in Business Analytics Programs

School	US News & World Report 2015 MBA Rank
NYU	10
UT Austin	15
Arizona State	27
Minnesota	33
Michigan State	35
Rochester	37
Univ. of Connecticut	52
SMU	55
University of Cincinnati	60
George Washington Univ.	65

Appendix 3: Peer Comparisons - Curriculum Content Comparisons of MS in Business Analytics Programs offered by MBA Ranked Peers

University MBA Ranking Degree	Curriculum/ Required Classes	Prerequisites	Comments
<p>New York University #10</p> <p>Master of Science in Business Analytics</p>	<p>Social Media and Digital Marketing Analytics</p> <p>Foundations of Statistics Using R</p> <p>Practical Data Science</p> <p>Prediction</p> <p>Data Mining for Business Analytics</p> <p>Data Driven Decision Making</p> <p>Network Analytics</p> <p>Decision Models</p> <p>Operations Analytics</p> <p>Advanced Decision Models</p> <p>Data Visualization</p> <p>Special Topics in Analytics: Revenue Management & Pricing</p> <p>Strategy, Change and Analytics</p> <p>Market Modeling</p> <p>Strategic Capstone</p>	<p>A bachelor's degree and strong Grade Point Average, demonstrated high aptitude for quantitative analysis and academic success as evidenced by undergraduate and graduate coursework as applicable. A minimum of five years of professional, full-time work experience is required.</p>	<p>One year duration. Five Residential Modules totaling to seven weeks of face-to-face education. Online work supplements traditional classroom work</p>

University MBA Ranking Degree	Curriculum/ Required Classes	Prerequisites	Comments
<p>University of Texas at Austin #15</p> <p>Master of Science in Business Analytics</p>	<p>Required Courses: Data Analytics Programming Optimization and Decision Analysis Financial Management Introduction to Data Management Introduction to Business Data Analytics Advanced Data Analytics I: Predictive Modeling Advanced Data Analytics II: Unsupervised Learning and Time Series Business Intelligence Capstone</p> <p>Electives: Advanced Data Mining and Web Analytics Marketing Analytics I Computational Finance Data-intensive Computing for Text Analysis Marketing Analytics II Pricing and Revenue Optimization Social Media Analytics Supply Chain Analytics</p>	<p>An undergraduate degree from an accredited institution</p> <p>Mathematical aptitude and quantitative and/or technical training in coursework</p> <p>Strong communication skills and motivation</p>	<p>36 Credits offered completed in 10 months.</p> <p>The program is designed for undergraduate degree holders in business, engineering, mathematics, economics, computer science, and other technical or quantitative areas.</p>

University MBA Ranking Degree	Curriculum/ Required Classes	Prerequisites	Comments
Arizona State University #27 Master of Science in Business Analytics	Required (Full lockstep program): Introduction to Enterprise Analytics Introduction to Applied Analytics Data Mining I Applied Regression Models Data-Driven Quality Management Analytical Decision Making Tools I Data Mining II Analytical Decision Making Tools II Business Analytics Strategy Applied Project	Bachelor's Degree GMAT or GRE	30 Credits Two Options: On Campus: 9 months Online (all online): 16 months Five-week sessions, one course at a time.

University MBA Ranking Degree	Curriculum/ Required Classes	Prerequisites	Comments
University of Minnesota #33 Master of Science in Business Analytics	Required Courses (Full lockstep program): Financial Accounting Introduction to Statistics for Data Scientists Analytics for Competitive Advantage Programming and Application Development Marketing Management Data Management, Databases, and Data Warehousing Harvesting Big Data Project Management, Leadership, Communications, and Team Dynamics Exploratory Data Analytics and Visualization Predictive Analytics Advanced Issues in Business Analytics Data-Driven Experimentation and Measurement Modeling and Heuristics for Decision Making and Support Experiential Learning	At least one-semester college level calculus course with a grade "C" or better GMAT or GRE	45 Credits in 1 Year.

University MBA Ranking Degree	Curriculum/ Required Classes	Prerequisites	Comments
<p>Michigan State University #35</p> <p>Master of Science in Business Analytics</p>	<p>Introduction to Business Analytics</p> <p>Project Management</p> <p>Computational Techniques for Large-Scale Data Analysis</p> <p>Communications Strategies for Analytics</p> <p>Applied Statistics Methods</p> <p>Marketing Technology and Analytics</p> <p>Statistical Problems</p> <p>Data Mining</p> <p>Emerging Topics in Business</p> <p>Capstone: Business Analytics</p> <p>Ethics and Intellectual Property Issues</p>	<p>A completed bachelor's degree from a recognized educational institution.</p> <p>A cumulative grade-point average of at least a 3.00 in undergraduate course work.</p> <p>Completed, with a grade of 3.0 or higher, college-level courses in introductory calculus and statistics.</p> <p>A working knowledge of personal computers.</p> <p>Knowledge of programming languages such as C, C++, Python, Java, HTML, as well as experience in using statistical packages, and use of statistical software programs.</p> <p>GMAT or GRE</p>	<p>31.5 Credits in One Academic Year. Requires a strong technical background.</p>

University MBA Ranking Degree	Curriculum/ Required Classes	Prerequisites	Comments
University of Rochester #37 Master of Science in Business Analytics	Required Courses: Data Structures (May be waived out, no credits, charge at review course rate) Information Systems Introduction to Business Analytics Framing and Analyzing Business Problems I Core Economics for MS Students Core Statistics for MS Students	GMAT or GRE	41-42 Credits. Can be finished in 1 year (three quarters). Variety of tracks. Offers a number of “selective” (either-or) course options.

University MBA Ranking Degree	Curriculum/ Required Classes	Prerequisites	Comments
<p>University of Connecticut #52</p> <p>Master of Science in Business Analytics and Project Management</p>	<p>Required Courses:</p> <p>Business Process Modeling and Data Management</p> <p>Predictive Modeling</p> <p>Business Decision Modeling</p> <p>Data Mining and Business Intelligence</p> <p>Introduction to Project Management</p> <p>Project Leadership and Communications</p> <p>Project Risk and Cost Management</p> <p>Advanced Business Analytics and Project Management</p> <p>Other Courses:</p> <p>Real-time Enterprise Data Integration and Audit</p> <p>Data Analytics with R</p> <p>Adaptive Business Intelligence</p> <p>Big Data Analytics with Hadoop</p> <p>Gamification</p> <p>Ethical and Legal Issues in Project Management</p> <p>Managing International Development Projects</p> <p>Agile Project Management</p>	<p>Completion of a one-semester college-level calculus course with a grade of “C” or better.</p> <p>An undergraduate degree (B.S. or B.A.) from a 4-year program at an accredited university or college.</p> <p>A minimum undergraduate grade-point average (GPA) of 3.0 for either all 4 years or for the last 2 years.</p> <p>GMAT or GRE.</p>	<p>33 Credits</p> <p>A joint degree in Business Analytics and Project Management</p> <p>Allows students to take MBA courses as electives</p>

University MBA Ranking Degree	Curriculum/ Required Classes	Prerequisites	Comments
<p>Southern Methodist University #55</p> <p>Master of Science in Business Analytics</p>	<p>Required Courses:</p> <p>Managing Your Career (1 credit)</p> <p>Applied Predictive Analytics I</p> <p>Decision Models</p> <p>Business Process Consulting</p> <p>Business Metrics</p> <p>Database Design for Business Applications</p> <p>Data Mining</p> <p>Applied Predictive Analytics II</p> <p>Web and Social Media Analytics</p> <p>Business Research Methods</p> <p>Data Visualization and Communications</p> <p>Electives (six courses from the below list):</p> <p>Consumer Behavior</p> <p>Advanced Decision Models</p> <p>Retailing Analytics</p> <p>Understanding What Customers Value</p> <p>Revenue Management</p> <p>Business Forecasting</p> <p>Operations Analytics</p> <p>Consumer Loyalty Management</p> <p>Database Marketing using Multivariate</p>	<p>At the discretion of the admissions committee, a student may be required to take the following courses before entry:</p> <p>Applied Statistics</p> <p>SAS Training</p> <p>GMAT or GRE.</p>	<p>33 Credits over one year schedule (four half semesters).</p>

	Analysis		
	Pricing Analytics		

	Project Management Managing Big Data Supply Chain Analytics		
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University MBA Ranking Degree	Curriculum/ Required Classes	Prerequisites	Comments
<p>University of Cincinnati #60</p> <p>Master of Science in Business Analytics</p>	<p>Required Courses (21 Credits):</p> <p>Optimization Simulation Modeling Probability Modeling Statistical Methods Statistical Modeling Research Project</p> <p>In addition 14 credits of electives from Business Analytics, Information Systems or Operations Management fields.</p>	<p>Before starting the program, students must have completed courses in calculus and linear algebra and demonstrate computer programming skills in a computer language such as Ruby, Python, C++, FORTRAN etc.</p> <p>Basic Business Knowledge Requirement: In addition, students are required to have taken before they start (or take during the program) a course in four of the following seven subjects:</p> <p>Operations management Information systems Finance Accounting Marketing Economics Management</p> <p>Bachelor's Degree and GMAT or GRE are required.</p>	<p>35 Credits</p> <p>Full Time (1 year) or Part Time (2 year) options available.</p>

University MBA Ranking Degree	Curriculum/ Required Classes	Prerequisites	Comments
<p>George Washington University #65</p> <p>Master of Science in Business Analytics</p>	<p>Required Courses:</p> <p>Introduction to Business Analytics</p> <p>Data Warehousing</p> <p>Computational Analytics</p> <p>Stochastic Foundations: Probability Models</p> <p>Statistics for Analytics</p> <p>Data Mining</p> <p>Forecasting for Analytics</p> <p>Optimization Methods & Applications</p> <p>Decision Analysis</p> <p>Risk Analytics</p> <p>Computational Optimization</p> <p>Electives:</p> <p>Marketing Analytics</p> <p>Supply Chain Analytics</p> <p>Pricing & Revenue Management Investment</p> <p>Analysis/Portfolio Management Social</p> <p>Network Analytics</p> <p>Healthcare Analytics</p> <p>Business Process Analytics</p> <p>Sports Analytics</p> <p>Visualization for Analytics</p>	<p>Statistics: applicants should have taken and obtained a B or higher in an undergraduate or graduate statistics within the last 5 years, be able to demonstrate regular use of statistics in a current or past professional position, or be able to demonstrate an adequate understanding of statistics in another way.</p> <p>Higher Level Mathematics (Calculus and Linear Algebra): applicants should have taken and obtained a B or higher in an undergraduate or graduate higher level math class, such as calculus or linear algebra, within the last 5 years, be able to demonstrate regular use of mathematic principles and methods in a current or past professional position, or be able to demonstrate an adequate understanding of higher level math in another way.</p> <p>Computer Programming: applicants should be able to demonstrate regular use of computer programming and software skills in a current or past professional position such as with SAS, SPSS, R Language, Python, Java, CPLEX, etc., or be able to demonstrate adequate exposure to and understanding of basic</p>	<p>33 Credits</p> <p>Can be completed between 10 months and years.</p>

	Business Analytics Skills Workshops	computer programming and software principles. Applicants need not have a	
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		<p>specific understanding of multiple analytics-based computer programs and software. Instead, the goal is for applicants to demonstrate that they are capable of learning the specific programs emphasized in the MSBA program.</p> <p>GMAT or GRE.</p>	
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DATE: December 6, 2015

TO: Dr. Alexander J. Triantis
Dean, Robert H. Smith School of Business

FROM: On behalf of the University of Maryland Libraries:

Zaida M. Díaz, Interim Head, Humanities Social Sciences Librarians and
Business and Economics Librarian

Maggie Saponaro, Interim Head of Collection
Development Daniel Mack, Associate Dean,
Collection Strategies & Services

RE: Library Collection Assessment

We are providing this assessment in response to a proposal by the Robert H. Smith School of Business to create the Master of Science in Business Analytics (MSBA). The MSBA program asked that we at the University of Maryland Libraries assess our collection resources to determine how well the Libraries support the curriculum of this proposed program.

Serial Publications

The University of Maryland Libraries currently subscribe to a large number of scholarly journals— almost all in online format. Many of these are top ranked journals by the **Social Science Citation Index*, in terms of impact and are widely recognized in the fields of strategy, management, organization theory, computation, etc., which would be relevant to the subject or program areas within business analytics, and the intersection of operations research, computing and data analysis. Among these, 14 scholarly journals published by the highly regarded Institute for Operations Research and the Management Sciences (INFORMS) that cover the latest research in Operations Research (O.R.) and analytics methods and applications, including: *INFORMS Transactions on Education* (an Open Access peer-reviewed journal), *Decision Analysis*, *Information Systems Research (ISR)*, *INFORMS Journal on Computing*, *Interfaces*, *Management Science*, *Operations Research*, *Manufacturing & Service Operations Management (M&SOM)*, *Marketing Science*, *Mathematics of Operations Research*, *Organization Science* and *Transportation Science*.

In cases in which the Libraries do not subscribe to highly ranked journals, for example: *Service Science* and *Strategy Science* (new in 2015), both also published by the INFORMS, or any other articles in journals that we do not own, they likely will be available through Interlibrary Loan/Document Delivery.

*Note: *Journal Citation Reports* is a tool for evaluating scholarly journals. It computes these evaluations from the relative number of citations compiled in the *Science Citation*

Index and Social Sciences Citation Index database tools.

Databases

The Libraries' *Database Finder* (<http://www.lib.umd.edu/dbfinder>) resource offers online access to databases that provide indexing and access to scholarly journal articles and other information sources. Many of these databases cover subject areas that would be relevant to proposed Master of Science in Business Analytics (MSBA) program. Among the core databases to find business literature review statistics and data analysis that would be useful in the study and research areas covered by the MSBA program are:

1. Business Source Complete (EBSCO) – Major scholarly business database providing a collection of bibliographic and full text content in all disciplines of business, including marketing, management, MIS, POM, accounting, finance, economics, including business analytics topics, etc. Additional full text, non-journal content includes financial data, books, monographs, major reference works, book digests, conference proceedings, case studies, investment research reports, industry reports, market research reports, country reports, company profiles, and SWOT analyses. Indexing and abstracts for scholarly business journals back to 1886 are included.
2. IBIS World – Database that provides research, statistics and analysis reports on industries in the United States, the United Kingdom, Australia and China.
3. Passport – Provides global statistics for 205 countries on economic indicators, health, foreign trade, environment, lifestyle, industrial and agriculture output, communications and more. It also includes market size data for over 300 consumer products and services, including reports covering analysis of drivers of the industry, industry risk, market data and segments, competitors and industry performance. It provides demographic trends, economic indicators, finance, foreign trade, health, labor force, industrial and agricultural production, environmental data, consumer expenditure patterns, retail sales, advertising and media patterns, consumer prices, household patterns, literacy rates, telecommunications, automotive and transport figures, travel and tourism, income and earnings potential.
4. Data-Planet Statistical Datasets (formerly Statistical Datasets (Proquest) – Provides easy access to statistics produced by the U.S. government, major international and intergovernmental organizations, professional and trade organizations, state government agencies, and universities.

Some of the other subject databases that would be relevant to this curriculum include:

1. Science Direct (Elsevier) – Peer-reviewed, full text database containing electronic book and journal titles covering the fields of science, technology and medicine. In addition to keyword searches, the image search and value added content associated with the publication can be found in the form of audio, video and datasets.

2. Computers & Applied Sciences Complete – Covers the research and development spectrum of the computing and applied sciences disciplines. CASC provides indexing and abstracts for nearly 2,200 academic journals, professional publications, and other reference sources from a diverse collection. Full text is also available for more than 1,000 periodicals.
3. MathSciNet via EBSCOhost – An electronic publication of the American Mathematical Society (AMS) offering access to a carefully maintained and easily searchable database of reviews, abstracts and bibliographic information for much of the mathematical sciences literature. Over 100,000 new items are added each year, most of them classified according to the Mathematics Subject Classification.
4. Scopus (Elsevier) – Largest abstract and citation database of peer-reviewed literature and quality web sources with smart tools to track, analyze, and visualize research from your region and from the rest of world. It contains more than 18,000+ titles from more than 5,000 international publishers; over 1,200 Open Access journals; 520 conference proceedings; over 650 trade publications; 315 book series; 33 million abstracts; results from 386 million scientific web pages;

23 million patent records from 5 patent offices; 37 million records—of which 18 million records include references going back to 1996 and 19 million pre-1996 records go back as far as 1823.

5. IEEE Xplore (IEEE) – Provides full-text access to IEEE transactions, journals, magazines and conference proceedings published since 1988 and all current IEEE Standards. Includes access to Bell Labs Technical journal Archive (BLTJA) 1922-2015.
6. Inspec Archive – Science Abstracts 1898-1968 – Created by the Institution of Engineering and Technology, is the leading bibliographic database providing abstracts and indexing to the world's scientific and technical papers in physics, electrical engineering, electronics, and computing and control engineering.

Also there are some general/multidisciplinary databases, such as: Academic Search Premier, MasterFILE Premier, JSTOR and ProjectMUSE that are good sources of articles relevant to for this new program.

In many, likely in most cases, these indexes offer full text copies of the relevant journal articles. In those instances in which the journal articles are available only in print format, the Libraries can make copies available to graduate students through either the Libraries' Article Express Program (<http://www.lib.umd.edu/access/article-express>) or via Interlibrary Loan. (Note: see below.)

Monographs

The Libraries regularly acquire scholarly monographs in business and related subject disciplines. Monographs not already part of the collection can usually be added upon request.

Even though most library research for this course/program likely will rely upon online journal articles, students may wish to supplement this research with monographs. Fortunately, more and more monographs are available as e-books. Even in instances when the books are only available in print, graduate students will be able to request specific chapters for online delivery through the Libraries' Article Express service.

A search of the University of Maryland Libraries' WorldCat UMD catalog was conducted, using a variety of relevant subject terms. This investigation yielded sizable lists of citations of books that we own. Searching *business analytics* as a topic, resulted in 114,491 titles, among them:

- Advanced business analytics creating business value from your data (2013)
- Big data, big innovation: enabling competitive differentiation through business analytics (2014)
- Predictive business analytics: forward looking capabilities to improve business

performance (2014)

- RapidMiner : data mining use cases and business analytics applications (2014)
- Business analytics : data analysis and decision making (2015)
- Modern analytics methodologies : driving business value with analytics (2015)
- Business intelligence and analytics : systems for decision support (2015)

A further similar search revealed that the Libraries' membership in the Committee on Institutional Cooperation (CIC) dramatically increases these holdings and citations with additional new 44,015 titles. As with our own materials, graduate students can request that chapters be copied from these CIC books if the books are not available electronically.

Article Express and Interlibrary Loan

These services offer online delivery of bibliographic materials that otherwise would not be available online. As a result, remote users who take online courses may find these services to be helpful. Article Express and Interlibrary Loan are available free of charge.

A special amenity for graduate students and faculty, the Article Express service scans and delivers journal articles and book chapters within three business days of the request--provided that the items are available in print on the UM Libraries' shelves or in microform. In the event that the requested article or chapter is not available on campus, Article Express will automatically refer the request to Interlibrary Loan (ILL). Interlibrary Loan is a service that enables borrowers to obtain online articles and book chapters from materials not held in the University System of Maryland.

Additional Materials and Resources

In addition to serials, monographs and databases available through the University Libraries, students in the proposed MSBA program will have access to a wide range of media, datasets, software, and technology. Library Media Services (<http://www.lib.umd.edu/lms>) houses media in a variety of formats that can be utilized both on-site and via ELMS/Canvas course media. GIS Datasets are available through the GIS Data Repository (<http://www.lib.umd.edu/gis/dataset>) while Statistical consulting and additional research support is available through the Research Commons (<http://www.lib.umd.edu/rc>) while technology support and services are available through the Terrapin Learning Commons (<http://www.lib.umd.edu/tlc>) .

The subject specialist librarian/s for business, Zaida Díaz zdiaz@umd.edu and Lily Griner griner@umd.edu serve as important resource to the MSBA program with their extensive experience in business research, which includes access to the Virtual Business Information Center (VBIC) portal <https://www.lib.umd.edu/vbic/>, a collection of electronic and print business resources intended to provide research assistance to the Robert H. Smith School of Business and general users seeking authoritative business information. Additionally, the business school can also rely on their own Financial Markets and Research Labs., where a wide variety of highly specialized financial and statistical analysis resources and datasets area available to their students and faculty, including personalized consultant services for data and research analysis for faculty and students from Charles Lahaie clahaie@rhsmith.umd.edu, Assistant Director, Financial Markets and Research Labs, as part of the Smith IT.

Other Research Collections

Because of the University's unique physical location near Washington D.C., Baltimore and Annapolis, University of Maryland students and faculty have access to some of the finest

libraries, archives and research centers, including major trade organizations and associations in the country vitally important for researchers in business and subject areas.

Conclusion

With our substantial journals holdings and index databases, as well as additional support services and resources, the University of Maryland Libraries have resources to support teaching and learning in business. These materials are supplemented by a strong monograph collection. Additionally, the Libraries Article Express and Interlibrary Loan services make materials that otherwise would not be available online, accessible to remote users in online courses. As a result, our assessment is that the University of Maryland Libraries are able to meet the curricular and research needs of the proposed Master of Science in Business Analytics (MSBA) program.