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January 7, 2016

Bradden Blair, PhD, MBA, MHA
Director of IS Programs
David Eccles School of Business
University of Utah
Salt Lake City, UT 84112

Dean Professor Blair,

The University of Utah Marriot Library appreciates the request to comment on our ability to support a new Master of Science in Business Analytics and a new Graduate Certificate in Business Analytics. The Library is committed to supporting the University and its faculty as they develop programs needed by our students.

Because the curriculum supporting the degree will be based to some extent on existing courses and largely involve existing faculty, and because similar programs of study exist in the MSIS program within the School of Business and the MS, PhD and big data programs in the School of Computing, our current collections should already have sufficient size and depth to satisfy the needs of most students and faculty.

The Marriott Library has book purchasing plans which provide for the acquisition of English language scholarly books published in topics relevant to business analytics programs. The Library also encourages faculty to work with librarians to strengthen book collections in subject areas where it may be necessary.

The Marriott Library maintains extensive holdings of scholarly journals in computer science, statistics, business and related disciplines. Specific journals supporting business analytics already provided by the Library include the *Decision Analysis* journal and the *Analytics Magazine* from INFORMS; the *IEEE Transactions on Knowledge and Data Engineering*; *Decision Analytics*; *Decision Support Systems*; *Intelligent Systems in Accounting, Finance and Management*; *EPJ Data Science*; *Information Visualization*; *Data Mining and Knowledge Discovery; Journal of Interactive Marketing; Journal of Big Data; Statistical Analysis and Data Mining; Journal of Management Information Systems; Strategic Management Journal;* the *MIS Quarterly;* the *Journal of Strategic Information Systems;* the *Journal of Data Science, Executive Strategies; Journal of Multi-Criteria Decision Analysis;* numerous publications from the Association for Computing Machinery like the *ACM Transactions on Knowledge Discovery in Data;* and many others. We would like to work with faculty to evaluate the most workable preferences for providing any additional needed periodical literature to support the program.

Cover/Signature Page – Full Template

Institution Submitting Request: *University of Utah*
Proposed Title: *Master of Science in Business Analytics*
School or Division or Location: *David Eccles School of Business*
Department(s) or Area(s) Location: *Marketing and Operations and Information Systems Departments*
Recommended Classification of Instructional Programs (CIP) Code[1] : *52.1301*
Proposed Beginning Date: *08/24/2016*
Institutional Board of Trustees' Approval Date: *MM/DD/YEAR*

Proposal Type (check all that apply):

Regents' Agenda Items		
R401-4 and R401-5 Approval by Committee of the Whole		
SECTION NO.		ITEM
4.1.1	☐	(AAS) Associate of Applied Science Degree
4.1.2	☐	(AA) Associate of Arts Degree
	☐	(AS) Associate of Science Degree
4.1.3	☐	Specialized Associate Degree
4.1.4	☐	Baccalaureate Degree
4.1.5	☐	K-12 School Personnel Programs
4.1.6	☒	Master's Degree
4.1.7	☐	Doctoral Degree
5.2.2	☐	(CER C) Certificate of Completion
5.2.4	☐	Fast Tracked Certificate

Chief Academic Officer (or Designee) Signature:
I certify that all required institutional approvals have been obtained prior to submitting this request to the Office of the Commissioner.

_____
Signature Date: *MM/DD/YEAR*

Printed Name: *Name of CAO or Designee (Ruth Watkins –Signature will be collected after Board of Trustees Approval)*

[1] CIP codes must be recommended by the submitting institution. For CIP code classifications, please see http://nces.ed.gov/ipeds/cipcode/Default.aspx?y=55.

Executive Summary
University of Utah
David Eccles School of Business
Master of Science in Business Analytics (MSBA)
08/19/2015

Program Description

The proposed Master of Science in Business Analytics (MSBA) is designed to provide students with the technical competence and business orientation necessary to successfully compete in the rapidly growing market for analytics and data science professionals. Enterprises in the private and public sectors are all in need of executives, analysts and specialists with training in these important areas. The MSBA is intended to attract full-time students and working professionals who want to deepen their understanding of the application of data and analytics to business problems. The MSBA is comprised of 10 core courses (27-credit hours), 1-2 elective courses (3-credit hours) and 1 capstone course (3-credit hours) for a total of 33 semester hours (minimum). The program is expected to commence in Fall Semester, 2016.

Role and Mission Fit

The proposed MSBA degree will provide the knowledge and skills students need in order to pursue a career in business analytics and data science. Although there are courses being taught in the Business School that address some of the topics related to analytics and data science, there are not any formal degree programs which are dedicated to this area. Local and multinational companies including Ebay, Overstock.com, Zions Bank, Domo, Qualtrics and Intermountain Healthcare have ecouraged the School to develop a program to address critical talent shortages in this area.

The mission of the David Eccles School of Business is to build foundations for ethical business leadership by creating, discovering and communicating knowledge about leading edge research, innovation, and best management practices. We believe that by preparing our graduates to be engaged citizens of the rapidly changing global world of business, and through the synergy of research, education and service, the David Eccles School of Business will continue to be among the most respected business schools in the world.

One of the bodies that evalutes our standing and repuation among business schools is the Association to Advance Collegiate Schools of Business (AACSB International). In 2013, AACSB International, updated its accreditation standards for collegiate business schools to recognize the growing importance of incorporating analytics and data science into business education. According to the standard, "All general management and specialist degree programs at the bachelor's, master's and doctoral level [should address] the following areas: Information technology and statistics/quantitative methods impacts on business practices to include data creation, data sharing, data analytics, data mining, data reporting, and storage between and across organizations including related ethical issues."[2] The MSBA degree will help us to meet these requirements and assume a position of leadership among PAC12 business schools.

The MSBA program will also contribute to the mission of the University of Utah through "*the discovery, creation and application of knowledge; through the dissemination of knowledge by teaching, publication…and technology transfer; and through community engagment*" in the area of analytics and data science (italicized language from the University Mission Statement). The core curriculum and matriculation

[2] http://www.aacsb.edu/en/accreditation/standards/2013-business/learning-and-teaching/standard9/

benchmarks are designed to facilitate discovery and knowledge creation not only at a broad level, but also specifically within the context of business.

Faculty

Because of the interdisciplinary nature of the MSBA program, students will have access to faculty from several different departments within the Eccles School and also from across campus (in particular, the School of Computing). The MSBA program can be launched initially with existing courses, but will also benefit from the development of additional courses to meet program demands and market needs. The David Eccles School of Business currently offers a Master of Science in Information Systems (MSIS) degree with a specialization in business intelligence and analytics and a graduate certificate in information systems. Included in both of these programs are core and elective courses in business intelligence and analytics, data mining, database theory and design, networking and servers, cloud computing, digital analytics and database marketing, digital campaign management and analytics, etc. Additional courses in predictive analytics, data visualization, big data and machine learning are also expected to be developed within the next 12 months.

The current faculty in the Eccles School are well prepared to begin teaching in the MSBA program. Many faculty are already consulting or conducting research in this area. Sixteen tenured or tenure-track faculty and 7 career-line faculty have been identified as having expertise in the topical areas related to this program. We have also developed a strong network of adjunct faculty who can advise and instruct as needed. Given our current level of proficiency in this area, we do not expect the need to hire additional full-time faculty to initiate this program. With growth in the program, we anticipate the need to hire two full-time faculty within the first 5 years of program implementation.

Market Demand

In March of 2015, the U.S. Department of Commerce released an economic brief in which they addressed the growing importance of data in the economy. One of the key findings of the report was the observation that data related jobs not only pay higher wages, but also represent a significant driver of occupational growth. Occupations where working with data is either central to or an important part of the job, currently account for over half of the workforce and this percentage is expected to grow. Not surprisingly, business and financial operations account for more data related jobs than any other occupational category (approx. 34% of all jobs).[3]

A recent report by McKinsey & Company highlighted the significance of big data as a pillar of competitive advantage. The report also noted that organizations are expected to face significant challenges in recruiting individuals with the necessary skills to take advantage of big data. The report estimates that "by 2018, the United States alone could face a shortage of 140,000 to 190,000 people with deep analytical skills as well as 1.5 million managers and analysts with the know-how to use the analysis of big data to make effective decisions"[4]. Left unaddressed, this shortage could have significant negative implications for Utah's future economic growth and development.

The launch of the MSBA program is timely, especially given the acute need for analytics talent in Utah.

[3] http://www.esa.doc.gov/sites/default/files/the-importance-of-data-occupations-in-the-us-economy_0.pdf
[4] http://www.mckinsey.com/insights/business_technology/big_data_the_next_frontier_for_innovation

Student Demand

Data collected from undergraduate students in the David Eccles School of Business suggests that demand would be strong for an MSBA program. In a May 2015 survey, 85% of students who responded to an internal survey suggested that they would consider completing an MS degree in business analytics. The breakdown of survey respondents by business major was as follows: business administration (21%), accounting (20%), operations management (14%), management (13%), finance (12%), marketing (9%), information systems (8%), and entrepreneurship (3%). It was interesting to note that while information systems and marketing have typically been majors of choice for students interested in analytics, these were among the least reported majors by survey participants. The result could indicate a growing interest and recognition by students in other business areas of the importance of data related skills and competencies.

Statement of Financial Support

Indicate from which of the following the funding will be generated. Provide the detail for funding as part of the "Financial Analysis" section. (Remove these descriptive italics after completing this section of the template.)

Appropriated Fund……	☒
Special Legislative Appropriation……	☐
Grants and Contracts……	☐
Special Fees ……	☐
Differential Tuition (must be approved by the Regents)……..	☒
Other (please describe)……	☐

Similar Programs Already Offered in the USHE

There are not currently any dedicated Master's degree programs in the Utah System of Higher Education in the area of business analytics. The closest programs are the University of Utah's Master of Science in Information Systems (MSIS), Master of Science in Computer Science (MSCS), Master of Science in Computing (MSC), graduate certificate program in information systems, graduate certificate program in Big Data, and Utah State University's Masters of Management Information Systems (MMIS).

On the University of Utah campus, the MSIS and graduate certificate in information systems are offered through the School of Business, and the MSCS, MSC, and big data certificate are offered through the School of Computing. The MSIS and graduate certificate in information systems offer students an opportunity to take courses in business intelligence and analytics, data mining, database theory and design, networking and servers, cloud computing, information security, system analysis and design, etc. The MSC and MSCS offer courses in data mining, maching learning, database systems, artifical intelligence, etc. The Eccles School markets an MSIS emphasis in business intelligence and analytics and the School of Computing markets an MSC and MSCS emphasis in data management and analysis. Although there are some similarities between courses in the information systems and computer science departments, our courses have generally included different content. Our departments have also traditionally served different markets. The MSIS and graduate certificate in information systems programs are intended to prepare students for business careers where an understanding of technology is of financial and strategic value to a firm. On the other hand, computing science graduates typically pursue careers in computer engineering or software development. Companies such as Adobe, EMC, Zions Bank, Goldman Sachs, and others recognize the differences between our programs and how we uniquely approach the big data

domain. This has also been readily apparent in discussions with technology leaders from companies who serve on the MSIS advisory board. While these existing programs do offer some training in analytics, these programs serve a different need than the one proposed in a dedicated Master of Science in Business Analytics.

The MMIS program at Utah State University contains core and elective courses in data mining, business intelligence, data analytics, database implementation, data security and big data. Although this program covers some of the fundamentals of business analytics, it also serves a more generalist need than a dedicated MSBA program.

Program Description – Full Template
University of Utah
Master of Science in Business Analytics
10/16/2015

Section I: The Request

The University of Utah requests approval to offer *the Master of Science in Business Analytics* effective *Fall 2016.* This program has been approved by the institutional Board of Trustees on *Date.*

Section II: Program Description

Complete Program Description

To thrive in today's competitive marketplace, organizations of all kinds need to capture, organize, analyze, synthesize and utilize data to make informed decisions. Knowledge and tools from disciplines like computer and information sciences, statistics, mathematics and the functions of business (e.g., marketing) are needed to make sense of high volumes of data. The Master of Science in Business Analytics (MSBA) is designed to provide students with the technical *competence* and business orientation necessary to compete successfully in the world of "big data." The MSBA is intended to attract full-time students and working professionals who want to deepen their understanding of the application of data analytics to business problems.

The MSBA is comprised of 10 core courses (27-credit hours), 1-2 elective courses (3-credit hours) and 1 capstone course (3-credit hours) for a total of 33 semester hours (minimum). The curriculum is built around an industry certification for analytics professionals and includes classes in data storage and management, data analysis using statistical and machine-learning methods, data visualization and applications to marketing, finance, operations management, accounting, strategy and management. All courses, and especially the capstone course, include instruction in and experience with defining business and analytic problems, collecting and organizing data, creating models to analyze the defined problem, and presenting results to communicate to business executives. Upon completion of the courses and capstone experience, students will be prepared to become certified as a Certified Analytics Professional Associate through INFORMS.[5]

Purpose of Degree

The MSBA is designed to meet the quickly growing needs of industry for analytics professionals. A 2009 article in the *New York Times*[6] stated, "In field after field, computing and the Web are creating new realms of data to explore — sensor signals, surveillance tapes, social network chatter, public records and more." The article goes on to say, "'We're rapidly entering a world where everything can be monitored and measured,' said Erik Brynjolfsson, an economist and director of the Massachusetts Institute of Technology's Center for Digital Business. 'But the big problem is going to be the ability of humans to use, analyze and make sense of the data.'" The purpose of the MSBA degree is to prepare students to be the kind of "humans" to which Dr. Brynjolfsson refers.

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[5] See https://www.certifiedanalytics.org/

[6] "For Today's Graduate, Just One Word: Statistics," New York Times, August 5, 2009. http://www.nytimes.com/2009/08/06/technology/06stats.html. Note that the article was written more than 5 years ago, emphasizing the need for the MSBA degree to be established as soon as possible.

The *Times* article emphasizes the need for analytics professionals nationally, but we have strong industry support for such individuals in our local and regional market. Section III speaks in much more detail to the need of a local program, but we note here that a focus group of representatives from healthcare, finance, marketing, manufacturing, software and other organizations showed that without a doubt industry is hungry for qualified analytics professionals and they see a master degree in analytics as one significant way to meet their demand. We agree and believe that the MSBA will provide them with the personnel they are seeking.

Institutional Readiness

The David Eccles School of Business already offers several standalone master degrees and has created an infrastructure to manage such programs. That infrastructure includes some centralized functions (e.g., a centralized Business Career Services and a graduate admissions group) and some program-specific administration (program directors and managers). The School has an associate dean who oversees all such programs and program directors meet together regularly to identify, discuss and address issues that are common to all programs.

The addition of the MSBA degree will require the appointment of a program director, a part-time career counselor, and at least one supporting staff member to have the same capabilities as the existing programs. In the first couple of years it is possible that an existing director (e.g., the director of the Master of Science of Information Systems (MSIS) program) and associated staff – minus the career personnel – will be able to manage the MSBA program. The anticipated growth, however, will require that a separate director and staff be selected.

In terms of faculty, the School is well-positioned to offer the courses required for the program. There are scholars and teachers in several departments (including those specializing in marketing, information systems, strategy and statistics) who already offer courses with heavy analytics components and hence are prepared to offer the classes proposed for the new program. Some of those faculty do teach undergraduate classes, so there will necessarily be an impact on the staffing of lower-division courses. In the longer term, however, we anticipate that the expertise and experience gained through the new master program will lead to the establishment of new classes and even a degree program at the undergraduate level that emphasizes analytics. In order to grow, additional faculty will need to be hired to staff classes within the program or to staff classes that are left unstaffed because of a shift of faculty to courses in the new program. Subsequent sections provide more detail on the faculty.

Departmental Faculty

Because the program is cross-disciplinary within the Eccles School, it is difficult to list "departmental" faculty. Because the instructions said not to provide a program-specific headcount, we have included numbers for two of the departments that will be most closely associated with the MSBA program: Marketing and Operations and Information Systems. Not all members of the faculty of those two departments will participate in the program; similarly, faculty from other departments (e.g., Strategy and Entrepreneurship, Computer Science) will teach in the program but are not included in the count of faculty in the table. The numbers were determined based on the knowledge of the relevant department chairs.

Department Faculty Category	Dpt Faculty Headcount – Prior to Program Implementation	Faculty Additions to Support Program	Dpt Faculty Headcount at Full Program Implementation
With Doctoral Degrees (Including MFA and other terminal degrees, as specified by the institution)			
Full-time Tenured	16	2	18
Full-time Non-Tenured	4		4
Part-time Tenured			
Part-time Non-Tenured			
With Master's Degrees			
Full-time Tenured			
Full-time Non-Tenured	3		3
Part-time Tenured			
Part-time Non-Tenured	18		18
With Bachelor's Degrees			
Full-time Tenured			
Full-time Non-Tenured			
Part-time Tenured			
Part-time Non-Tenured			
Other			
Full-time Tenured			
Full-time Non-Tenured			
Part-time Tenured			
Part-time Non-Tenured			
Total Headcount Faculty in the Department			
Full-time Tenured			
Full-time Non-Tenured			
Part-time Tenured			
Part-time Non-Tenured			
Total Department Faculty FTE *(As reported in the most recent A-1/S-11 Institutional Cost Study for "prior to program implementation" and using the A-1/S-11 Cost Study Definition for the projected "at full program implementation.")*	26	2	28

Staff

To be similar to staff in other specialized master degrees, we anticipate the need for one program director, one program manager (who will also act as an advisor and help supervise capstone projects), and a half-time career counselor. There will also be some need for teaching assistants, but we should be able to use existing PhD students to fill those roles.

Library and Information Resources

The current resources available through the Marriott Library are anticipated to be sufficient for the implementation of the new program.

Admission Requirements

The admission requirements for the MSBA degree will be almost identical to those of other programs within the David Eccles School of Business. Because of the quantitative nature of the program, more weight will be given to the quantitative section(s) of standardized tests and to quantitative undergraduate courses. The evidence currently used by other programs when making admissions decisions, and anticipated to be used for the MSBA degree, are delineated below.

- School of Business Online Application

- GRE/GMAT Test Score

  An official GRE or GMAT test score is required for all MSBA applications. There are no minimum GRE or GMAT scores required for application. Applicants are encouraged to meet overall program GRE/GMAT averages, but all application materials are evaluated to determine the strength of the application.

- Transcripts / GPA
  This requirement includes a list all colleges and universities applicants have attended including the University of Utah, regardless of length of attendance. Official transcripts from each institution will be required.

  A minimum cumulative 3.0 undergraduate GPA is required for admission. We will accept a 3.0 GPA from the last 60 credit hours taken in cases where overall GPA values fall below 3.0.

- Two Letters Of Recommendation

- One statement-of-purpose essay, describing the applicant's intent and goals for the program (submitted within the online application).

- Résumé

- English Language Proficiency.

  International applicants must receive a minimum score of 90 on the TOEFL ibt exam or 6.5 on the IELTS exam.

Student Advisement

As with other MS programs in the Eccles School, a dedicated advisor will be assigned to the MSBA program. The advisor will meet with students one-on-one and will have regular opportunities to interact with the students in larger groups. Career counselors will work with students to identify potential employment opportunities and to advise concerning résumés, interviewing skills, etc. Faculty will also provide mentoring to students and provide curriculum and career guidance to the extent possible.

Justification for Graduation Standards and Number of Credits

The program is a 33-credit hour program. The number of credits is the minimum required to have the necessary exposure to core topics in analytics and to gain more experience in one functional area such as marketing analytics. A 33-hour program also allows students who work full time to take classes in the evening and complete the program in 3 semesters.

External Review and Accreditation

We did not employ the services of any external consultants in the creation of the program. We did conduct extensive benchmarking of schools offering similar programs such as Arizona State and The University of Southern California and a very informative focus group meeting with representatives from several different industries, including healthcare, software, marketing/advertising and financial services.

Like all of the programs in the David Eccles School of Business, the MSBA will be subject to accreditation review by the Association to Advance Collegiate Schools of Business (AACSB). The School and its programs are evaluated approximately once every five years. We have designed the MSBA program with AACSB requirements and recommendations in mind.

We will strongly encourage students in the program (and in some cases alumni) to become certified as Certified Analytics Professional Associates through the Institute for Operations Research and the Management Sciences (INFORMS)[7]. According to their website, INFORMS "is the largest society in the world for professionals in the field of operations research (O.R.), management science, and analytics." Their certification (referred to as CAP) has quickly become the standard in analytics certification and will provide graduates of the MSBA program unequivocal credentials that will help them find appropriate (and likely high paying) careers where they can apply analytics principles daily.

Projected Program Enrollment and Graduates; Projected Departmental Faculty/Students

The student FTE numbers in the table below are based on enrollments in the Marketing and Operations and Information Systems undergraduate majors and master degrees. Each undergraduate student enrolled in a major was considered 1.0 FTE, while each student in the MSIS program was considered only .75 FTE. The total FTE assumes growth in existing programs as well as in the new program.

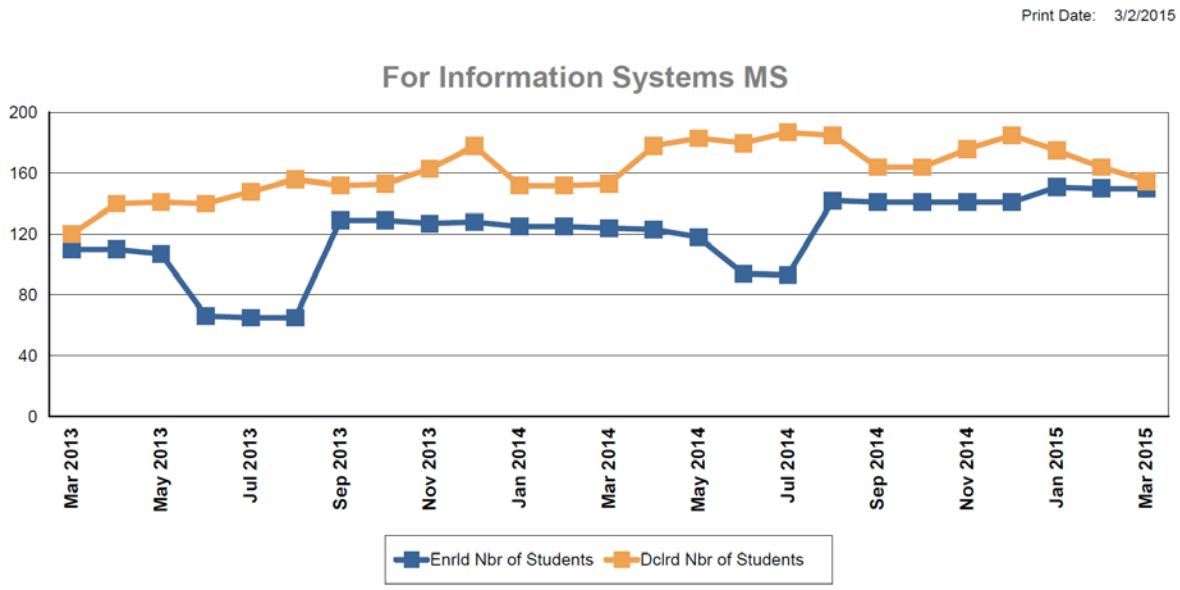
Data Category	Current – Prior to New Program Implementation	PROJ YR 1	PROJ YR 2	PROJ YR 3	PROJ YR 4	PROJ YR 5
Data for Proposed Program						
Number of Graduates in Proposed Program	X	5	10	20	30	40
Total # of Declared Majors in Proposed Program	X	10	20	30	40	50
Departmental Data – For All Programs Within the Department						
Total Department Faculty FTE *(as reported in Faculty table above)*	26	26	26	27	27	28
Total Department Student FTE *(Based on Fall Third Week)*	530	540	565	600	645	700

[7] See https://www.certifiedanalytics.org/

Student FTE per Faculty FTE *(ratio of Total Department Faculty FTE and Total Department Student FTE above)*	20.4	20.8	21.7	22.2	23.9	25.0
Program accreditation-required ratio of Student FTE/Faculty FTE, if applicable: (Provide ratio here:_____)						

Expansion of Existing Program

The MSBA program is new, although we anticipate that it will cannibalize some students from the Business Intelligence and Analytics emphasis of the MSIS program. The MSIS program has seen exceptional growth since its inception. The graphic below shows the growth of the program between March 2013 and March 2015. The program continues to grow and as of Sep. 27, 2015, an internal report showed 182 enrolled and 198 declared MSIS students. Numbers for the same time period (the end of September) since 2011 are shown below the plot. (There is some discrepancy between the graph and the table; we have tried to refine our data collection methods, but (ironically) there continue to be some issues with the data.)



Student Counts in the MSIS Program

Year	Number Enrolled	Number Declared
2011	62	68
2012	109	112
2013	127	142
2014	141	157
2015	182	198

Differentiation from MSIS Program

The proposed MSBA program differs from the MSIS program in the following ways.

1. The MSBA program is multi-disciplinary, with a broader and more intensive focus than in the MSIS program on discipline-related problems, particularly in marketing (customer relationship management, database marketing, e-commerce, internet advertising, social media, search engine optimization, segmentation, etc.).
2. Unlike the MSIS Business Intelligence and Analytics track, which consists of the MSIS core with elective work in analytics, the MSBA offers an exclusive focus on analytics for all 33 hours of the program. This results in roughly twice the analytics content in comparison to the MSIS Business Intelligence and Analytics emphasis.
3. Because of this focus, the MSBA program covers all areas required for the INFORMS CAP certification. The stand-alone degree will also provide for better adaptability to changing certification requirements in the future.
4. The MSBA program will place a stronger emphasis on problem framing, selection of appropriate analytic techniques, and the reporting of results to functional managers.
5. A dedicated degree will allow the Eccles School to market it accurately and more efficiently as a degree in business analytics.

As a result of having multiple programs, students will be offered a choice between a pure IS focus, the blended MSIS emphasis on Business Intelligence and Analytics, and the pure MSBA in analytics with preparation for the CAP certification. From the marketing side, students will face a choice between an MBA degree with coursework in analytics and the MSBA degree. We see these options as a way of better serving the market, just as students can currently select between the MBA and MSIS programs or the MBA and MSF programs.

Finally, we note that (1) the Association for Information Systems/Association for Computing Machinery (AIS/ACM) have put out a model MSIS curriculum for which many of the courses in the proposed MSBA curriculum do not fit and (2) many of the business schools we benchmarked outside the state of Utah had both analytics and information systems master degrees.

Differentiation between the proposed MSBA Degree and Existing Programs at the University of Utah

There are not currently any dedicated Master's degree programs in the Utah System of Higher Education in the area of business analytics. The closest programs are the University of Utah's Master of Science in Information Systems (MSIS), Master of Science in Computer Science (MSCS), Master of Science in Computing (MSC), graduate certificate program in information systems, graduate certificate program in Big Data, and Utah State University's Masters of Management Information Systems (MMIS).

On the University of Utah campus, the MSIS and graduate certificate in information systems are offered through the School of Business, and the MSCS, MSC, and big data certificate are offered through the School of Computing. The MSIS and graduate certificate in information systems offer students an opportunity to take courses in business intelligence and analytics, data mining, database theory and design, networking and servers, cloud computing, information security, system analysis and design, etc. The MSC and MSCS offer courses in data mining, maching learning, database systems, artifical intelligence, etc. The Eccles School markets an MSIS emphasis in business intelligence and analytics and the School of Computing markets an MSC and MSCS emphasis in data management and analysis. Although there are some similarities between courses in the information systems and computer science

departments, our courses have generally included different content. Our departments have also traditionally served different markets. The MSIS and graduate certificate in information systems programs are intended to prepare students for business careers where an understanding of technology is of financial and strategic value to a firm. On the other hand, computing science graduates typically pursue careers in computer engineering or software development. Companies such as Adobe, EMC, Zions Bank, Goldman Sachs, and others recognize the differences between our programs and how we uniquely approach the big data domain. This has also been readily apparent in discussions with technology leaders from companies who serve on the MSIS advisory board. While these existing programs do offer some training in analytics, these programs serve a different need than the one proposed in a dedicated Master of Science in Business Analytics.

College Review

This proposal was approved by the Master's Program Committee on *November 5, 2015* and by the College Council on *November 24, 2015*. It was approved by the full faculty of the David eccles School of Business on *December 1, 2015*.

Section III: Need

The MSBA will be differentiated from the existing MSIS emphasis in that it will provide a more focused analytics experience and broader exposure to analytics applications in areas such as digital marketing and e-commerce. Students will thus be offered a choice between a pure IS focus, the blended MSIS emphasis on Business Intelligence and Analytics, and the pure MSBA analytics focus with preparation for the CAP certification.

Program Need

Enterprises in the private and public sectors need employees who know how to gather, store and analyze data to make informed decisions. As the Labor Market Demand section will elaborate, the demand for analytics professionals with both business and data science knowledge has been growing rapidly in the state of Utah and the rest of the nation. The courses in the new program integrate quantitative and business knowledge in real-world oriented contexts. No other program in the state, to our knowledge, provides students with the skills needed to frame relevant business problems, translate those problems into analytics problems, determine the necessary data, create relevant models, use the models to compare alternative solutions and ultimately make and communicate fact-based decisions.

While we believe the proposed MSBA is unique in the state of Utah, the growing demand for graduates with analytics know-how has led to several new programs at other reputable schools in the United States and (to a lesser degree) across the world. The proposal is a necessary move to stay competitive with the other programs in the nation and to meet market and student needs.

To emphasize the need for the program, we include excerpts from a recent email from one of our professional MBA alumni. His message underscores the desire of organizations to hire people well versed in business analytics as well as the relative dearth of individuals with the requisite skills. We believe the new program will help remedy the deficiency described by the alumnus.

> Dear Ute Friends,

I recently attended a non-profit benefit here in Atlanta for an organization called Computers for Youth (CFY). During the conference I was able to mingle with executives and professionals from many fortune 500 organizations. As I sat down next to my sponsor, a recruiter for me at att.com, she introduced me to a table full of people, many of whom were also recruiters within the analytics industry.

We conversed for the better part of 3 hours about the digital analytics industry and its rapid growth. After the benefit proceedings I found myself speaking with a lead recruiter from Cox Media/AutoTrader/Manheim whose entire portfolio was dedicated to analytics talent placement. He asked me some very pointed questions. "Why doesn't the University of Utah have a robust analytics program? After all isn't Utah the home of analytics as we know it? Aren't there a ton of analytics companies there?"

Granted, it has been several years since I completed my PMBA at the U. But in that time, I've seen the analytics industry explode. It is entirely possible that the opportunities to which I will refer to learn analytics have increased as a curriculum at the U. Perhaps I'm just missing it. But even today as I look through the list of possible majors I don't see "Analytics", "Business Intelligence", "Digital Analytics", "Data Systems Management", "Data Sciences" or "Implementation of Analytics" as possibilities. We may be missing an enormous opportunity and one that should rightfully belong to the University of Utah.

Today, as the markets become almost entirely digital recruiters and hiring managers alike are in need of technology savvy teammates. They are seeking people with very unique skill combos in today's market such as basic programming of HTML, JavaScript and CSS mixed with statistics, SQL, data management and business management to place in these roles.

Hiring managers are currently required to provide intensive on-the-job training to develop understanding of the tools and methods used in our industry. It's very strange. It would seem to me that if the market is clamoring for these skills sets, educational entities would benefit by preparing future graduates with those skills and opportunities.

With this reference point, I write to you as a voice in the market and as an ally. The analytics industry will continue to grow for a long time to come. Many campuses across the globe have already begun to add this specific coursework to their curriculum; a few have been at it for a while and are well ahead of the game. But none in my estimation should be able to do this better than the University of Utah.

To compete with these schools, to prepare students to fill these roles will require more than incidental or peripheral contact with the topics mentioned above …. COMMERCE IS CHANGING TO ECOMMERCE. We should be molding our curriculum to reflect that. Technology will be huge part of commerce for the foreseeable future and digital analytics is at the center of that technology. We need multiple analytics tracks available at the David Eccles School of Business to support this burgeoning industry.

As a Ute graduate twice over, I take great pride in the quality of education and my experience at my Alma-mater. I consider my past professors, school administrators, facilities and classmates

second to none. I hope this communication will be received well, as insight coming from a proud member of our team and Ute community. I humbly request your assistance to get this through the right channels such that analytics may be added as multiple programs of study as soon as possible at the University of Utah. Go Utes!

The following sections provide additional evidence that highlight several reasons for providing a new MSBA program at the University of Utah.

Labor Market Demand

In March of 2015, the U.S. Department of Commerce released an economic brief in which they addressed the growing importance of data in the economy. One of the key findings of the report was the observation that data related jobs not only pay higher wages, but also represent a significant driver of occupational growth. Occupations where working with data is either central to or an important part of the job, currently account for over half of the workforce and this percentage is expected to grow. Not surprisingly, business and financial operations account for more data related jobs than any other occupational category (approx. 34% of all jobs).[8]

A recent report by McKinsey & Company highlighted the significance of big data as a pillar of competitive advantage. The report also noted that organizations are expected to face significant challenges in recruiting individuals with the necessary skills to take advantage of big data. The report estimates that "by 2018, the United States alone could face a shortage of 140,000 to 190,000 people with deep analytical skills as well as 1.5 million managers and analysts with the know-how to use the analysis of big data to make effective decisions"[9]. Left unaddressed, this shortage could have significant negative implications for Utah's future economic growth and development.

Besides the evidence from national sources, we also have strong anecdotal evidence that local organizations are excited and ready for a program in analytics. On July 17, 2015, we held a focus group with representatives from Adobe, Domo, Qualtrics, Overstock.com, Zions Bancorp, Intermountain Healthcare, InMoment and MRM/McCann. The job titles of those who participated were Predictive Markets Sr. Product Mgr., Insights and Innovations Lead, Chief of Staff over Analytics, Data Scientist, Senior Analyst, IT Corporate Recruiter, Data Warehouse Analysis Manager, BI Development Manager, HR Workforce Solutions/Analytics Dir., Vice President of Business Analytics, and Senior Vice President of Analytics and Insights. The focus group voiced strong support for a business analtyics program, helped define what such a program would look like and indicated that they very much would like to hire graduates from a business analytics program at the University of Utah.

To lend support to what we heard in the focus group,below we include a sampling of job descriptions that have been advertised to current MSIS students (especially those emphasizing analytics and business intelligence) for which graduates of the new MSBA degree would be highly qualified. The announcements emphasize the demand by employers for a graduate program to prepare students for such positions.

Intermountain℠ Healthcare

[8] http://www.esa.doc.gov/sites/default/files/the-importance-of-data-occupations-in-the-us-economy_0.pdf
[9] http://www.mckinsey.com/insights/business_technology/big_data_the_next_frontier_for_innovation

Analytic Data Developer | Nov. 1

Being a part of Intermountain Healthcare means joining with a world-class team of over 36,000 employees and embarking on a career filled with opportunities, strength, innovation, and fulfillment. Our mission is: Helping people live the healthiest lives possible.

Our patients deserve the best in healthcare, and we deliver.

This position develops and manages data that supports analytical activities within the actuarial departments of SelectHealth. This position provides expertise on data sources and data requirements for financial and analytical projects, in collaboration with actuarial analysts and business intelligence developers. This position works with many types of data including claims, member enrollment, premium, healthcare providers, fee schedules, and data from external sources (vendors, clients, government).

Honeywell

Big Data Database Administrator Full-time

The BigData/Hadoop Technical Analyst will reports to the Director of the Database and Web Hosting Services organization. This position will ensure operational support, stability and delivery for BigData/Hadoop cutting edge technologies such as Cassandra, HBase/Hadoop, Greenplum, and Aster across platform in on-prem and cloud environment. BigData/Hadoop Technical Analyst will be working with the Data Science IT and Engineering teams to ensure the data infrastructure is optimal and humming.

Summit IT Specialist | 10-15

We live in an era of remarkable change and opportunity. Data and technology are transforming industries, society, and even the workplace–by creating professions that didn't exist before the emergence of analytics, cloud, social, mobile and security. As the largest technology and consulting employer in the

world, IBM is a leader in this global transformation and just the place to start your Technical Specialty career.

Business Intelligence Developer | Full-time

UIT-University Support Services has an immediate opening for a BI Developer. This position is focused on developing and supporting the Enterprise Data Warehouse and the reporting solutions across our Teaching and Learning, Finance, Human Resources, and Facilities/Ancillary Services environments. This position will be responsible for the development of functional specifications to fulfill the data requirements for delivering comprehensive business intelligence solutions, data mart design, reporting and analytics. Strong data modeling, SQL skills and knowledge of 3rd party reporting tools is required.

Uof UBusiness Data Analyst (SQL/PeopleSoft report writer)- Full-time

Ready for U!!! Career growth opportunity in the growing Human Resource Management Analytics field for a self-motivated, degreed individual with 2-4+ years' experience related to data mining, report generating, and data presentation. Responsible for generating ad-hoc reports via SQL queries and PeopleSoft query manager, conducting basic data analysis, proactively creating business reports library and maintaining KPIs.

Multiple Full-Time Positions

Did you miss them at last weeks fair? You have one more chance! Apply in UCareerpath by Friday Oct 2!
GM is hiring multiple entry level positions
(1) Data Analytic Developer
(2) Software Developer

(3) Software Test Analyst
(4) Software Test Analyst

Want to work for the Patriots in The Kraft Group in Boston?
Business Intelligence Manager

The Manager of Business Intelligence will define BI technologies and work closely with the Director of Business Intelligence during BI implementation. The Manger of business intelligence will help assess the current state of the data, provide insight of available technologies, and work closely with vendors during vetting and implementation. Upon implementation of a data warehouse and visual analytics, the Manager of Business Intelligence will oversee projects and data flows from beginning to completion, including ETL/ELT pipelines to dashboards and reports.

Student Demand

In April 2015 we conducted a survey of undergraduate students within the David Eccles School of Business to gauge interest in a degree in analytics. The exhibits below are excerpts from the result of the survey. The results show that more than half of the nearly 400 respondents would either definitely pursue or strongly consider pursuing an advanced degree in business analytics. Of 58 students who indicated that they would not likely pursue such a degree, only about 25% indicated that they were not interested in analytics; the majority had other reasons including no desire for an advanced degree or plans to do graduate work outside of Utah. We were very encouraged by the results of the survey, which reinforced the strong demand from industry and suggested by the growth of analytics programs in other states.

Year in School:

#	Answer	Bar	Response	%
1	Freshman		31	8%
2	Sophomore		54	14%
3	Junior		134	34%
4	Senior		173	44%
	Total		392	

Interest in an Analytics Master Degree:

1. If the Business School offered a one-year master degree in Business Analytics how interested would you be in gaining that degree?

#	Answer	Bar	Response	%
1	I would definitely pursue that degree.		59	15%
2	I would strongly consider that degree.		144	37%
3	I would consider that degree.		131	33%
4	I would not be interested in that degree.		58	15%
	Total		392	

Reasons for Lack of Interest:

2. Please provide the most applicable reason why you would not be interested.

#	Answer	Bar	Response	%
1	I am not planning on pursuing a master degree.		5	9%
2	I am planning on pursuing a master degree somewhere else.		15	26%
3	I have chosen a different degree and am too far along to change.		6	10%
4	I am not interested in Business Analytics.		15	26%
5	I am not sufficiently familiar with the field of business analytics.		11	19%
6	Other (please specify)		6	10%
	Total		58	

Desired Emphases:

3. Which emphasis within the program would you be most interested in?

#	Answer	Bar	Response	%
1	Accounting		42	13%
2	Data Science		71	21%
3	Economics		16	5%
4	Finance		66	20%
5	Marketing		66	20%
6	Operations Research		43	13%
7	No emphasis		20	6%
8	Other (please specify)		7	2%
	Total		331	

Similar Programs

We did our best to learn of other programs in the state of Utah offering degrees related to Business Analytics. The following table shows the results of our benchmarking study (the differentiation of the MSBA program from our own MSIS program was discussed above). The bottom line is that while there are programs or certificates that have some overlap with parts of the proposed curriculum, there is no master degree in the state that is dedicated to business analytics. Moreover, even if there were degrees at other institutions, geographical considerations make it imperative that there be a degree program in the Salt Lake area.

Institution	Unit	Name of Program	Description	Links
University of Utah	School of Computing	Data Management and Analysis (MS and PhD)	The rate at which scientists and businesses are producing data is increasing at an unstoppable rate. Being able to efficient process and make sense of such data has become a key scientific challenge in computer science. Not only must one be able to store such information compactly, but one additionally must develop algorithms to process it efficiently and intelligent systems that can reason about this data to find interesting patterns or make decisions. These topics form the core of the Data Management and Analysis track.	http://www.cs.utah.edu/graduate/ http://www.cs.utah.edu/graduate/hb2014-15/gradhbk2014-15-ms-phd_data/
University of Utah	School of Computing	Big Data Certificate	Big Data is impacting many areas of science, engineering,	http://www.cs.utah.edu/bigdata/

			and industry; from analyzing troves of weather data to modeling traffic patterns to processing millions of online customers, it is the enormous data which is creating new opportunities and challenges. To tackle these challenges, one must have the training to store, manage, process and analyze data at these scales. But the challenges are beyond scale alone, the complexity of the data requires new powerful analytical techniques. Finally, it is crucial to have skills in communicating and interpreting the results of this analysis. A person trained in all of these skills is a big data scientist.	http://www.cs.utah.edu/bigdata/FAQ/
Utah State	Huntsman School of Business		The Masters of Management Information Systems (M-MIS) program in the Jon M. Huntsman School of Business at Utah State University offers students an opportunity to make a difference in the organizations with which they work. Our innovative, project-based curriculum carries a STEM* designation in database management and analytics, consistently attracting many talented students from around the world. "Big Data, its proponents insist, will be the next big trend in management." ~ NY Times. The dynamic job market currently requires a solid analytical and technological foundation; therefore, our data-focused curriculum concentrates on the decision-making process and the	http://huntsman.usu.edu/mmis/ http://huntsman.usu.edu/mmis/htm/curriculum

			valuable role technology plays in its enhancement. Upon graduation, M-MIS students compete in the marketplace with solid database, web development, business analysis, and IT strategy training to complement the Huntsman School of Business acumen.	
Utah Valley University		Information Systems - Business Intelligence Systems Emphasis, B.S.	The BS in Information Systems program prepares students to be Information Systems professionals. Graduates develop and deploy enterprise-level systems to meet organizational needs. The Business Intelligence Systems (BIS) emphasis prepares graduates to become business intelligence analysts who produce financial and marketing intelligence by querying data repositories, generating reports, and devising methods for identifying data patterns and trends. Organizations store an enormous amount of data. People who are able to perform data mining and can analyze the data to detect trends and form predictions are highly sought by national and regional organizations.	http://www.uvu.edu/catalog/current/departments/information-systems-and-technology/information-systems-business-intelligence-systems-emphasis-bs/
Salt Lake Community College	Computer Sciences and Information Systems Division	Database Information and Technology Certificate of Proficiency	The program provides students a well-rounded introduction to acquiring knowledge and skills in designing, processing and managing business database systems.	http://www.slcc.edu/catalog/current/csis_data_cp.pdf

*Southern Utah, Snow College, Dixie State, and Weber State had no programs that were similar to what we were looking for.

Collaboration with and Impact on Other USHE Institutions

Because most of the programs currently offered overlap only slightly with the proposed MSBA degree, we have not had much conversation with others. We have discussed the plans for our degree with the School of Computing within the University of Utah and they will participate in the program, in particular in the data visualization class. We don't foresee negative impact on other institutions with the introduction of the degree. We hope that our sister schools that offer information systems, mathematics, statistics, computer science, marketing and other similar undergraduate degrees will make their students aware of the analytics degree at the University of Utah and encourage their students to pursue graduate education with us.

Benefits

The principal benefits of the program will be to current and potential students at the University of Utah and to the business community in the greater Salt Lake area (and beyond). The successful implementation of the program will raise the visibility of the David Eccles School of Business and help with the current trend of improved rankings for the School. Quoting again from the alumnus's letter cited in the "Need" section above, "But [no other institution] in my estimation should be able to do this better than the University of Utah." The reputational and economic benefits from the program should be significant.

Consistency with Institutional Mission

The mission of the David Eccles School of Business is to build foundations for ethical business leadership by creating, discovering and communicating knowledge about leading edge research, innovation, and best management practices. We believe that by preparing our graduates to be engaged citizens of the rapidly changing global world of business, and through the synergy of research, education and service, the David Eccles School of Business will continue to be among the most respected business schools in the world.

The proposed MSBA degree will provide the knowledge and skills students need in order to pursue a career in business analytics and data science, skills that are becoming more and more necessary to compete in a global marketplace. Leadership in business today requires the ability to make fact-based decisions. Hence the degree aligns directly with the School's mission to build foundations for business leadership.

The MSBA program will also contribute to the mission of the University of Utah through "*the discovery, creation and application of knowledge; through the dissemination of knowledge by teaching, publication…and technology transfer; and through community engagment*" in the area of analytics and data science (italicized language from the University Mission Statement). The core curriculum and matriculation benchmarks are designed to facilitate discovery and knowledge creation not only at a broad level, but also specifically within the context of business.

Section IV: Program and Student Assessment

Program Assessment

As assessment and student learning outcomes continue to be significant emphases within the School and the University, we hope to refine and improve measures of assessment as the program grows. For now, we have the following desired goals for student performance and success.

- Recruiting, admission and retention goals and measures
    - Goals – to recruit high-caliber applicants and retain students in quantities that meet or exceed the five-year program size projections.

    - Measures – applicant pool size and program size, # of applicants recruited per recruiting channel/event, average GRE or GMAT and GPA of applicants and of students (especially in quantitative areas), # of applicants, and students by most recent location and degree/institution.
- Student learning and graduation goals and measures
    - Goals – to graduate 95% of the students admitted who meet the learning goals of MSBA.
    - Measures – the learning measures include
        - The student demonstrates analytics and data science knowledge, technical skills and business understanding in the classes with 3.0 or higher GPA.
        - The student is effective in integrating business knowledge and analytics concepts in a real world project by achieving a B or higher grade from the capstone class.
        - The student is effective with analytical and critical thinking as measured using assignments or projects in program course work.
        - The student is effective with teamwork as measured using group projects in the program study.
        - The student is effective with written and oral communication measured using assignment, case analysis, and project writing and presentation in classes.
        - The student is able to complete satisfactorily the INFORMS CAPA certification requirements.
- Placements goals and measures
    - Goals – to help MSBA graduates obtain career opportunities that leverage the knowledge they have learned in the program.
    - Measures – # of positions by title, skills used, companies and industry as well as average salaries, sign-on bonus, and stock options received in students' offers.
- Student evaluation goals and measures
    - Goals – to assure positive student and graduate perceptions of program design, study benefits and quality of cohort for improvement of the MSBA Program.
    - Measures – summaries of students' mid study, exit, and alumni interviews/surveys
- External evaluation goals and measures
    - Goals – to assume positive perceptions of students and graduates by recruiters, guest speakers, project sponsors and coordinators for MSBA students for improvement of MSBA program.
    - Measures – summaries of external surveys
- Financial goals and measures
    - Goals – to meet or exceed the budget projection
    - Measures – Student credit hours, revenues from MSBA, and scholarships and program funds raised.

Expected Standards of Performance

MSBA students will be expected to meet the performance standards in the following competencies, which are based on the "Domains" and associated "tasks" identified in the INFORMS "Certified Analytics Professional" certification.[10]

Domain I Business Problem (Question) Framing

[10] These competencies are taken directly from the following website: https://www.informs.org/ORMS-Today/Public-Articles/October-Volume-39-Number-5/Certified-Analytics-Professional.

T-1 Obtain or receive problem statement and usability requirements
T-2 Identify stakeholders
T-3 Determine if the problem is amenable to an analytics solution
T-4 Refine the problem statement and delineate
T-5 Define an initial set of business benefits
T-6 Obtain stakeholder agreement on the problem

Domain II Analytics Problem Framing

T-1 Reformulate the problem statement as an analytics problem
T-2 Develop a proposed set of drivers and relationships to outputs
T-3 State the set of assumptions related to the problem
T-4 Define key metrics of success
T-5 Obtain stakeholder agreement

Domain III Data

T-1 Identify and prioritize data needs and sources
T-2 Acquire data
T-3 Harmonize, rescale, clean and share data
T-4 Identify relationships in the data
T-5 Document and report findings (e.g., insights, results, business performance)
T-6 Refine the business and analytics problem statements

Domain IV Methodology (Approach) Selection

T-1 Identify available problem solving approaches (methods)
T-2 Select software tools
T-3 Test approaches (methods)
T-4 Select approaches (methods)

Domain V Model Building

T-1 Identify model structures*
T-2 Run and evaluate the models
T-3 Calibrate models and data*?
T-4 Integrate the models*
T-5 Document and communicate findings (including assumptions, limitations and constraints)

Domain VI Deployment

T-1 Perform business validation of the model
T-2 Deliver report with findings; or
T-3 Create model, usability and system requirements for production
T-4 Deliver production model/system*
T-5 Support deployment

The main mechanism that will be used to evaluate whether or not students have mastered the 6 domains above will be the CAP certification itself. Due to anticipated limitations on experience, the majority of the graduates of the program will be expected to pursue the *Associate* CAP, specifically designed for recently graduated students.

Section V: Finance

Department Budget

Because of the cross-functional nature of the program (in that it cuts across department lines) and after consulting with the University's budget office, we determined that the table provided in the template and

shown below did not apply very well to our proposal; hence we left it blank. Instead, we created the table included on p. 26 that shows the incremental budget information for the proposed MSBA degree for the next five years.

Three-Year Budget Projection							
Departmental Data	Current Departmental Budget – Prior to New Program Implementation	Departmental Budget					
		Year 1		Year 2		Year 3	
		Addition to Budget	Total Budget	Addition to Budget	Total Budget	Addition to Budget	Total Budget
Personnel Expense							
Salaries and Wages							
Benefits							
Total Personnel Expense	$	$	$	$	$	$	$
Non-Personnel Expense							
Travel							
Capital							
Library							
Current Expense							
Total Non-Personnel Expense							
Total Expense *(Personnel + Current)*	$	$	$	$	$	$	$
Departmental Funding							
Appropriated Fund							
Other:							
Special Legislative Appropriation							
Grants and Contracts							
Special Fees / Differential Tuition							
Total Revenue	$	$	$	$	$	$	$
Difference							
Revenue-Expense	$	$	$	$	$	$	$
Departmental Instructional Cost / Student Credit	$	$	$	$	$	$	$

Hour* *(as reported in institutional Cost Study for "current" and using the same Cost Study Definition for "projected")*							

** Projected Instructional Cost/Student Credit Hour data contained in this chart are to be used in the Third-Year Follow-Up Report and Cyclical Reviews required by R411.*

MSBA Students	Year 1	Year 2	Year 3	Year 4	Year 5
Incremental Headcount	10	20	30	40	50
Tuition per student	$28,000	$28,000	$28,000	$28,000	$28,000
MSBA Revenue = Tuition	Year 1	Year 2	Year 3	Year 4	Year 5
Gross Tuition	$280,000	$560,000	$840,000	$1,120,000	$1,400,000
Tuition to Eccles (80%)	$224,000	$448,000	$672,000	$896,000	$1,120,000
TOTAL Expenses	Year 1	Year 2	Year 3	Year 4	Year 5
Staff Salaries, Wages, & Benefits	$39,000	$39,000	$227,500	$227,500	$227,500
Faculty Salaries, Wages, & Benefits	$50,000	$350,000	$380,000	$680,000	$680,000
Travel	$5,000	$5,000	$25,000	$25,000	$25,000
TOTAL Expenses	$94,000	$394,000	$612,500	$912,500	$912,500
MSBA Revenues - Expenses	$130,000	$54,000	$59,500	($16,500)	$207,500
Certificate Students	Year 1	Year 2	Year 3	Year 4	Year 5

Incremental Headcount	5	10	15	20	25
Tuition per student	$15,000	$15,000	$15,000	$15,000	$15,000
Cert. Revenue = Tuition	Year 1	Year 2	Year 3	Year 4	Year 5
Gross Tuition	$75,000	$150,000	$225,000	$300,000	$375,000
Tuition to Eccles (80%)	$60,000	$120,000	$180,000	$240,000	$300,000
Total MSBA Degree + Cert Revenues - Expenses	$190,000	$174,000	$219,500	$203,500	$487,500

Summary

The above figure shows the current conservative estimate of incremental student headcount and revenue for both the proposed MSBA degree as well as the graduate certificate in business analytics (for which we have created a separate proposal), as resources and expenses for both programs will be shared. As you can see, the student headcount from both the degree program and certificate lead to a total tuition which will more than fully fund the new program. Therefore, we expect there will be no impact to the existing budgets of the Eccles School or the University to fund the program.

Funding Sources

Revenue

Our primary funding source is from tuition to the program. The portion of that tuition which stays within the David Eccles School of Business is roughly 80%. It is also likely that donations from alumni and other supporters would flow to the program, but for now, we will stick with the conservative tuition-only estimate.

Headcount

We have based revenue on the assumption that we will grow roughly 10 students per year. This estimate is reasonable based on our student surveys, discussions with both students and corporate partners, and our past MSIS program growth of over 150 students enrolled approximately 5 years after the program was approved. While this 150 student number includes more than students who began the program in that year. Assuming even 50% were new students (a high estimate), we are still being conservative with our MSBA growth target of 50 students in year 5.

For the graduate certificate, we conservatively estimated half the incremental headcount of the MSBA degree program.

Tuition

We have based tuition on the current rate for our MSIS program multiplied by the total MSBA program of 33 credit hours. The tuition rate is reasonable given the similar level (and, therefore, compensation) of job prospects expected out of the program. This is also a lower rate than some of our peer institutions. It is

likely that this tuition will grow over the 5 years, but we have taken a simplistic stance in keeping this number (as well as expenses) constant over this time period.

For the graduate certificate, we have estimated tuition based on an 18 credit hour program to be completed over two semesters.

Expenses

We have broken down expenses into three categories, based on previously approved program budgets. Resources and expenses for both the MSBA degree program and the graduate certificate program will be shared.

The relevant expenses are the following: staff, faculty, and travel.

Staff

As mentioned previously, the MSIS program is a similarly quantitatively-based graduate business program. As such, where possible, resources will be shared across these two programs. Four areas of staff support to consider are Program Management, Admissions, Academic Advising, and Career Services.

- Program Management: In the first two years, the budding program can be managed by existing Program Leadership (e.g. MSIS Program Director). After the program has been established, however, a new Program Director will be necessary in year three to manage and grow the MSBA program. This position will teach, and as such, part of the salary is included in the Staff Wages and part in Faculty Wages.
- Admissions: Given a recent reorganization and the fact that we've hired new admissions staff in other areas, our current MSIS admissions staff has bandwidth to support the admissions work for this new degree. No new staff needed.
- Academic Advising: We have recently added a new FTE to the MSIS staff, allowing some part of the academic advising to be completed with existing headcount. New program manager to be added in year three.
- Career Services: Currently, we have one person supporting both graduate and undergraduate information systems students. There is no additional bandwidth there. We propose adding 0.5 FTE of Career Services staff to support this new program. Given a roughly 200 graduate student/career counselor ratio, this FTE will be able to help build relationships in the early years and will develop the career services programming in addition to counseling students. They will also teach a portion of the capstone course for these students. We estimate the cost of this FTE to be $39,000, which includes 30% in benefits.

Faculty

As per the faculty grid in section II, we currently have the expertise within the university to teach the courses offered in this new degree. That being said, we recognize there will be a need to hire adjunct faculty or to teach an overload for some of these courses. Therefore, we have allocated $50,000 per year for adjunct faculty. In addition, in years two and four, we expect the enrollment size to fund one additional

tenure-track hire. We estimate the all-in cost to be $300,000 per faculty member, including 30% benefits, research funding, etc.

Travel
A small travel budget has been included for admissions, recruiting, etc. Given that admissions and advising will be shared resources, we estimate this need to be small, e.g. admissions personnel attending a graduate program fair would already be paid for on behalf of the MSIS program. In year 3 when a new Program Director and Program Manager are hired, we have increased the travel budget to account for additional trips (potentially internationally).

Reallocation
No internal reallocation is requested at this point.

Impact on Existing Budgets
Because the program will be self-sufficient, the program does not impact the existing budgets of other units.

Section VI: Program Curriculum

All Program Courses (with New Courses in Bold)

The following highlights the requirements for completing the MSBA degree:

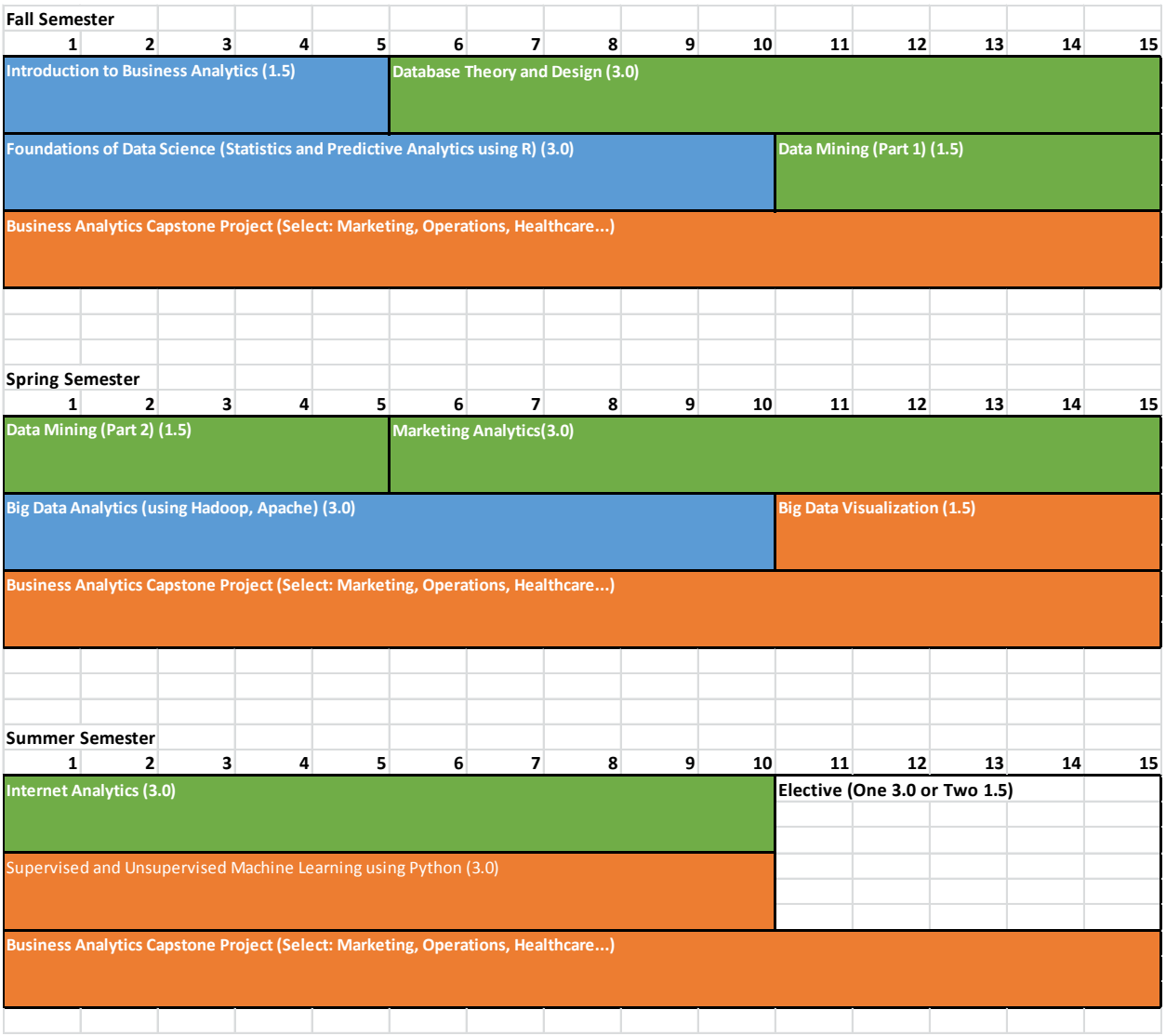
- 33 credit hours consisting of 10 core courses (27-credit hours), 1-2 elective courses (3-credit hours) and 1 capstone course (3-credit hours) for students who meet the MSBA degree prerequisites or equivalent at the time of admission. Students without prior coursework in statistics will be required to complete an additional three hour statistics course prior to the start of their first semester.
- 27 required core credit hours. Students with a substantial background in statistics or database theory and design may request approval to substitute elective classes for these core courses.
- A 3 hour capstone project in one of several tracks such as marketing, operations, and healthcare.
- 3 elective credit hours. Illustrative elective courses are listed below. With permission from the MSBA curriculum committee, students can take courses in other schools (e.g., Computer Science) to expand their business, management, computing, statistics or other specialized knowledge. The IS, MKTG, and OIS electives listed below are open to all students in the MSBA program. Other electives may be open only to students with the appropriate prerequisites in prior coursework or professional background, at the discretion of the offering department.
- The list of courses is as follows.

Course Prefix and Number	Title	Credit Hours
Required Courses		
IS XXXX	Introduction to Business Analytics	1.5
OIS XXXX	Foundations of Data Science	3.0
IS 6420	Database Theory and Design	3.0
IS 6482	Data Mining	3.0
MKTG 6600	Marketing Analytics	3.0
IS 6481	Big Data Analytics	3.0
IS XXXX	Big Data Visualization	1.5
MKTG 6310	Marketing through Interactive Media	3.0
IS/MKTG XXXX	Supervised and Unsupervised Machine Learning	3.0
IS XXXX	Business Analytics Capstone Project	3.0
OIS 6610	Practical Management Science	3.0
	Sub-Total	30
Elective Courses	*Select 3 hours from the following*	
ACCT 6210	Strategic Cost Management	3.0
ACCT 6610	Financial Reporting	3.0
ACCT 6620	Business Analysis and Valuation	3.0
IS 6483	Advanced Data Mining	3.0
IS 6484	Advanced Data Management	3.0
IS 6480	Data Warehousing Design and Implementation	3.0
MKTG 6730	Strategic Marketing Communications	3.0
MKTG 6770	Consumer Insights and Analytics	3.0

Course Prefix and Number	Title	Credit Hours
FINAN 6390	Financial Modeling	3.0
FINAN 6400	Financial Engineering	3.0
OIS 6500	Visual Basic Applications for Business	1.5
OIS 6425	Lean Six Sigma	3.0
STRAT 6850	Business Analytics	3.0
	Sub-Total	3
Track/Options (if applicable)		
	Sub-Total	
	Total Number of Credits	33

Program Schedule

The following figure shows the courses in the MSBA curriculum in an illustrative schedule. Courses for the MSBA consist of those already offered within the DESB (green), courses which are currently offered but which will require some degree of modification for the MSBA program (blue), and courses which are not currently offered (orange). The new courses will benefit students in the MBA/PMBA program and other specialized master's programs in addition to students in the MSBA program. (The figure does not include the Practical Management Science simulation and optimization class, which students will take at some point of their program online.)



Courses Currently Offered

Database Theory and Design, Data Mining, Marketing Analytics, Big Data Analytics and Marketing through Interactive Media are all offered currently in essentially the same format as required for the MSBA program. Additional sections of these courses may be required as demand for the MSBA degree grows, although initial enrollments can be accommodated largely within existing sections.

Courses Requiring Modification

Introduction to Business Analytics. Similar to IS 6580 Data Science and Big Data Analytics currently taught by Mike Boyle. This course requires modification to an introductory role in the MSBA program and reduction to 1.5 credit hours.

Foundations of Data Science. Introductory course in statistical methods and predictive analysis. Similar to OM6040/6041 Data Analysis and Decision Making I/II currently taught by Don Wardell. The course will require modification to the MSBA program and the use of R.

New Courses

Big Data Visualization. Initial staffing is anticipated in conjunction with Department of Computer Science using adjunct faculty or PhD students.

Supervised and Unsupervised Machine Learning. Initial staffing by tenure-track faculty or adjunct faculty is anticipated.

Business Analytics Capstone Project. Similar to the current MSIS capstone project. Three semester long blocks focusing on career development, project identification, and project execution.

Professional Certification

The MSBA curriculum is designed to prepare students for the INFORMS Certified Analytics Professional (CAP) certification. It is expected that most students who graduate from the program will elect to pursue this certification. The CAP certification requires preparation in the following areas:

- Business Problem Framing
- Analytics Problem Framing
- Data
- Methodology Selection (Optimization, Simulation, Regression, Statistical Inferences, Classification, Clustering, Artificial Intelligence)
- Model Building
- Deployment
- Model Life Cycle Management

The following figure maps the core courses in the MSBA program to the CAP requirements:

Class	I: Business Problem (Question) Framing	II: Analytics Problem Framing	III: Data	IV: Methodology (Approach) Selection	V: Model Building	VI: Deployment	VII: Model Lifecycle Management
Introduction to Business Analytics (5 Weeks)	I	I					
Foundations of Data Science: Statistics and Predictive Analytics (using R) (10 Weeks)		I	I	I	I	I	
Database Theory and Design (10 Weeks)	I	I	I	I			
Data Mining (10 Weeks)	R	I	R	I	I	I	

Marketing Analytics (10 Weeks)	I	I	R	I	I	I	
Big Data Analytics (using Hadoop, Apache) (10 Weeks)	I	I	I	I	R	I	
Big Data Visualization (5 Weeks)	R	R	R	I	I	I	
Business Analytics Capstone Project	R	R	R	R	R	R	R
Supervised and Unsupervised Machine Learning (using Python) (10 Weeks)	I	I	R	I	I	I	I

Business Decision Modelling and Simulation (5 Weeks)	I	I			I	I	
Marketing through Interactive Media (10 Weeks)	I	I	I			I	
I = Introduce							
R = Reinforce							

Section VII: Faculty

NOTE: The number of faculty listed here does not completely match the numbers provided in tables above. There are two principal reasons: (1) the earlier tables included part-time faculty while the table below does not; and (2) the template said to only count "departmental faculty" when creating the tables above. In the table below, we include two full-time faculty who are outside of the Marketing and OIS departments and hence were not counted earlier.

Tenure-track	Rank	Department
Rohit Aggarwal	Associate Professor	Operations and IS
Krishnan Anand	Associate Professor	Operations and IS
Manu Goyal	Assistant Professor	Operations and IS
Paul Hu	Professor	Operations and IS
Jaelynn Oh	Assistant Professor	Operations and IS
Nabita Penmetsa	Assistant Professor	Operations and IS
Vandana Ramachandran	Assistant Professor	Operations and IS
Glen Schmidt	Professor	Operations and IS
Oliva Sheng	Professor	Operations and IS
Don Wardell	Professor	Operations and IS
Shyam Gopinath	Assistant Professor	Marketing
Arul Mishra	Professor	Marketing
Himanshu Mishra	Professor	Marketing
Bill Moore	Professor	Marketing
Jason Snyder	Assistant Professor	Entrepreneurship and Strategy
Miriah Meyer	Assistant Professor	School of Computing
Career-line and Adjunct		
Bradden Blair	Assistant Professor—Lecturer	Operations and IS
Mike Boyle	Assistant Professor—Lecturer	Operations and IS
Chris Dansie	Assistant Professor—Lecturer	Operations and IS
Tariq Mughal	Assistant Professor—Lecturer	Operations and IS
Chong Oh	Assistant Professor—Lecturer	Operations and IS
Weiyu Tsai	Associate Professor—Lecturer	Operations and IS
Antony Passey	Assistant Professor—Lecturer	Marketing

The Marriott Library also provides many databases that will support the new programs: *Web of Science; Scopus; Inspec*; *IEEEXplore*; *Computing Reviews*; *Computer Source; WorldCat; Dissertations & Theses Global; Business Source Premier; BizMiner; BMI Research; IBISWorld Industry Research; MarketResearch.com; PrivCo; Value Line; Mergent Intellect*; and several others.

Student difficulties in locating materials often stem not from collection weaknesses, but from the complexities of using a large research library. We offer class presentations and one-to-one consultations with library specialists and other information specialists who can help students find the most relevant works and suggest the most appropriate research strategies.

We look forward to working with the faculty and students in this new program.

Yours truly,

Rick Anderson
Associate Dean
Collections and Scholarly Communication
J. Willard Marriott Library

David Eccles School of Business
THE UNIVERSITY OF UTAH

January 12, 2016

To whom it may concern:

I have reviewed the proposal for the Master of Science in Business Analytics degree and the accompanying certificate. I was involved in the development of the program and find it to provide excellent coverage of business analytics topics. It is a much needed program both for the Marketing Department and the Eccles School as a whole.

Recent shifts in the way marketing is practiced along with the much greater availability of customer and transactional data have created an environment in which analytical skills are becoming necessary for careers in the field, particularly in areas such as digital marketing and social media. Not only are such skills required, a premium exists in the market for graduates equipped with analytic capabilities such that I expect graduates of the program to be in high demand. The Department is already experiencing much increased interest in our analytics offerings among students. Our Marketing Analytics class, for example, which will be part of the new program, is at its capacity for the spring semester with 60 students versus a historical average of around 30.

The program will allow the Marketing Department and Eccles School to remain competitive with peer institutions. In the western region, Arizona State, UCLA, USC, and Berkeley offer similar programs. All indications are that these programs have been highly successful—they are drawing quality students in good numbers and placing graduates effectively. The program will also allow us to build up the teaching capabilities of the Department and School in these areas which will benefit students in our other master's programs as well as our undergraduate students.

Importantly, I anticipate that the Marketing Department will be able to meet the demands of the program without having to make compromises in other areas. Initial coverage will draw on existing tenure track and highly qualified adjunct instructors. Thus, from a departmental standpoint, I am strongly in favor of the program. It has also received unanimous support from members of the department.

Thank you in advance for your support.

Sincerely,

Chair, Department of Marketing

Marketing Department
1655 E. Campus Center Drive, Salt Lake City, UT 84112-9304

THE UNIVERSITY OF UTAH

SCI INSTITUTE

Scientific Computing and Imaging Institute

72 S. Central Campus Dr., Suite 3750, Salt Lake City, Utah 84112

January 11, 2016

To Whom It May Concern:

It is my understanding the David Eccles School of Business is proposing a master's degree and graduate certificate in business analytics. I am writing this letter in response to your request for a letter of support from the Scientific Computing and Imaging Institute and Office of the Assistant Vice President for Research – Corporate Relations for your proposal.

As noted in the proposal, the need for business analytics professionals has increased dramatically in recent years. Demand for data savvy graduates from both the information systems and computer science programs at the University of Utah is on the rise.

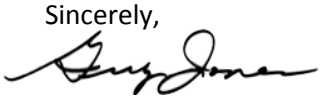
You may be aware the MSCS, MSC, and big data certificate, offered through the School of Computing as well as collaborations with the Math Department. While there are some similarities between courses in the math, information systems and computing science departments, School of Computing courses have generally included different content. School of Computing programs serve a different population of students with differing needs and desired career goals. For example, although the business school does offer coursework in computer programming, their graduates do not receive the same level of training in programming or pursue the same positions as computer science graduates.

Companies such as Adobe, EMC, Zions Bank, Goldman Sachs, and others recognize the differences between the programs and the unique approaches to the analytics domain. This has been readily apparent in discussions with technology leaders from these companies.

It is my belief that these proposals, as well as new developments from the School of Computing can only collectively strengthen the analytics prowess at the University of Utah.

Thank you for the opportunity to review and respond to your proposal. I wish you the best as you take the next steps in the approval process.

Sincerely,



Greg M. Jones
Assistant Vice President for Research,
USTAR/Corporate Relations
Associate Director,
Scientific Computing and Imaging (SCI) Institute
Adj. Asst. Professor Radiology
University of Utah

THE UNIVERSITY OF UTAH

Mathematics
155 S. 1400 E. Room 233 Salt Lake City, Utah 84112-0090 801-581-6851 FAX 801-581-4148

Graduate Council
University of Utah
302 Park Building
201 South Presidents Circle
Salt Lake City, UT 84112-9016

Members of the Graduate Council:

I support the proposal from the David Eccles School of Business to create a Master of Science in Business Analytics (MSBA) degree. The MSBA degree includes classes in statistics and operations research, both of which are mathematical topics, but are oriented towards business and therefore complement the course offerings of the Department of Mathematics.

You may also be aware that the Department of Mathematics and the School of Computing are collaborating on a new Masters degree aligned with the needs of industry in the region. We have met with representatives from the Eccles School and based on our discussions, we agree that the two degrees (the MSBA and the degree in Data Science) will largely serve different markets. We also believe that there will be opportunities to collaborate by allowing students from each program to take classes in the complementary program. The combination of the two degrees will create a distinctive advantage for the University of Utah as the premier regional center for education in analytics and data science.

Sincerely,

Peter E. Trapa
Professor and Chair

David Eccles School of Business
THE UNIVERSITY OF UTAH

January 11, 2016

To Whom It May Concern:

The David Eccles School of Business is proposing both a master's degree and a graduate certificate in business analytics. I am writing this letter in response to a request for a letter of support from me as the dean of the Eccles School.

The need for business analytics professionals has increased dramatically in recent years as we've seen as heard in both the business and higher education press as well as from our very own students and employers.

In fact, one of the bodies that evaluates our standing and reputation among business schools, the Association to Advance Collegiate Schools of Business (AACSB International), in 2013 updated its accreditation standards to recognize the growing importance of incorporating analytics and data science into business education. According to the standard, "All general management and specialist degree programs at the bachelor's, master's and doctoral level [should address] the following areas: Information technology and statistics/quantitative methods impacts on business practices to include data creation, data sharing, data analytics, data mining, data reporting, and storage between and across organizations including related ethical issues." These new programs will help us to meet these requirements and to assume a position of leadership among PAC12 business schools.

The mission of the David Eccles School of Business is to build foundations for ethical business leadership by creating, discovering and communicating knowledge about leading edge research, innovation, and best management practices. We believe that by preparing our graduates to be engaged citizens of the rapidly changing global world of business, and through the synergy of research, education and service, the David Eccles School of Business will continue to be among the most respected business schools in the world.

I believe that these new business analytics programs will not only further the mission of the David Eccles School of Business but will also further advance the mission and goals of the University of Utah by promoting student success, developing and transferring new knowledge from faculty research, and ensuring the long-term viability of the university by bringing in new revenues to the school and university.

Thank you for the opportunity to share my perspective on the new business analytics degree proposals. I am excited for the positive impact these programs will provide our college, our university, our students, and the community.

Sincerely,

Taylor Randall
Dean
David Eccles School of Business

THE UNIVERSITY OF UTAH

SCHOOL OF COMPUTING

50 C. Central Campus Drive RM 3190 Salt Lake City, UT 84112 801.581.8224 (Fax) 801.581.5843

February 12, 2016

Members of the Graduate Council:

I am writing to express my support for the proposed Master of Science in Business Analytics (MSBA) degree, to be offered by the David Eccles School of Business. This degree is clearly in the spirit of some emerging trends in academics, business, and industry that we generally refer to as *data science*. As the MSBA proposal states (and the Graduate School is no doubt aware), there are other existing degrees that attempt to address needs in this space. However, I believe that the MSBA, with its specific business emphasis and particular set of targeted students and employment opportunities, plays a unique and important role at the University and should move forward.

In the weeks leading up to the proposal I have had a couple of conversations with Don Wardell and other faculty in the School of Business. In those meetings I expressed my support for the degree, but also expressed my reservations about the naming of some of the classes. Some of the classes, such as "Machine Learning", are named in a way that is very similar (or exactly the same as) computer science classes taught by the School of Computing. Some of these topics are traditional, core topics in computer science. When the Business School teaches these topics, they typically have a very different set of students and different (but possibly overlapping) learning objectives. These naming conventions can (and have) led to confusion for employers and students, who may not be clear on the different objectives of these classes. The issues are not new to the MSBA, but this new program, because of its data and computational orientation, significantly expands the set of classes that fall into this potentially problematic space of names. Thus, we have taken the opportunity presented by this new program to open a conversation with the Business School faculty about such naming conflicts, and we have reached a good faith agreement such that in the future both programs will try to identify potential conflicts and work in a cooperative, open way to resolve them in a way that is good for the students and the University at large. More specific aspects of this discussed are described in an MOU between the parties involved in those meetings.

More generally, I want thank the Graduate School for bringing the issues regarding this new program to our attention and for facilitating this conversation between these two schools. I think we all agree that the prevalence of data in our economy, culture, and science, and the academic issues around data management and analysis are bound to become important aspects of a general University education. Therefore the School of Computing believes that it will behoove the University to get into these new spaces in an efficient, effective manner that results in the best use of State resources and the best opportunities for our students. Thus, we encourage the Graduate School to bring different entities together to work through these issues.

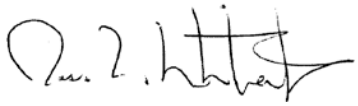
THE UNIVERSITY OF UTAH

SCHOOL OF COMPUTING

50 C. Central Campus Drive RM 3190 Salt Lake City, UT 84112 801.581.8224 (Fax) 801.581.5843

To summarize, I think the result of this whole process of approving the MSBA is an improved level of conversation among the parties involved. I can attest to the distinct and important nature of this new degree, and I support its approval.

Yours truly,



Ross Whitaker
Professor, Director