Change to Program/Graduate Diploma Academic Requirements Proposal Template

The following information is required for all proposals involving a change to program/graduate diploma academic requirements, including admission requirements. To facilitate the review/approval process, please use the headings below (and omit the italicized explanations below each heading).

1. Program/Graduate Diploma:

Master of Business Analytics (MBAN)

2. Effective Session of Proposed Change(s):

Summer 2018

3. Proposed Change(s) and Rationale

   The description of and rationale for the proposed change(s) should provide information with respect to each of the following points. Please provide:

   a) A description of the proposed change(s) and rationale, including alignment with academic plans.

   The Master of Business Analytics program has been a great success since its inception. The program grew from 4 students in its initiation year (2012) to 53 students in 2016. The two most important reasons for our program’s success are the program’s academic rigor and its close relationship with industry that integrates the learning outcomes that need to be achieved. From its infancy, the program had an Advisory Board consisting of business leaders in the analytics industry. In Appendix IV, we provide the list of our Advisory Board membership. Based on advice from the Board, the program has identified three major changes for the program:

   1. Introduction of new courses that reflect the new developments in the field of analytics, and
   2. Aligning the program structure in order to accommodate the new course structure.
   3. As an informational point, the program also intends to shift the program start from the Fall to the Summer semester in order to align the graduation of its students with the hiring cycle of industry.

   One change in the course structure is the revision of existing courses and the introduction of three new technical courses. These courses will help deepen and widen the analytical skills our students will obtain in areas such as visual analytics and big data. The introduction of the new courses is offset by a reduction in electives from 4 to 3 courses and the restructuring of the major research project.

   A second change is the removal of the Marketing and Supply Chain Management streams from the program. Students will no longer be required to choose their electives from a set of quantitative versus managerial courses. They will instead be free to choose from a list of elective courses.

   The proposed structure of the new version of the major research project was inspired by an exciting development in the field of business analytics. Organizations are conducting what is called “Big Data Competitions” where they provide real-life data to a group of scientists to come up with solutions to their business problems. These competitions provide significant learning opportunities both for organizations and also for the competitors (i.e. students). Motivated by these competitions, our Advisory Board...
suggested that we create a course that allows our students to work on real-life data. Our task force has decided to incorporate this opportunity into a newly reconfigured major research project. The new version of this course will replace the current version while retaining a significant cumulative and experiential project within the program, with data provided by organizations and analysed by our students. This community service project will also enable our students to directly interface with industry leaders and further develop their technical and organizational expertise while doing so.

Starting the program in the Summer session, rather than the Fall, will have positive implications for the placement of our students. Our program is a 12-month professional masters program, and it is our experience that our employers are seeking out our students in the October – December period. In order to provide our students more competitive capabilities, the program needs to start in Summer. This will ensure that students will have completed half the program (rather than just the first two months) before having to interview with potential employers.

Taken together, the proposed changes will result in providing our students with more in-depth understanding of Business Analytics and an enhanced exposure to the analytics community and, in doing so, create a program which is more attractive to both students and future employers. The proposed changes align with the University’s strategic plan of using high impact educational practices, including experiential education and project-based learning. While strengthening the curriculum, these changes also further the University’s quest to expand upon community engagement.

b) An outline of the changes to requirements and the associated learning outcomes, including how the proposed requirements will support the achievement of program/graduate diploma learning objectives.

The new, proposed curriculum will have 45 credits (36 core and 9 elective) instead of the current 42 credits. Table 1 compares the current and new program curriculum.

<table>
<thead>
<tr>
<th>TERM</th>
<th>EXISTING CURRICULUM</th>
<th>PROPOSED CURRICULUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>TERM 1 (Fall in the existing program, Summer in the new program)</td>
<td>MBAN 5110 (3.00) Introduction to Predictive Modelling</td>
<td>MBAN 5140 (3.00) Visual Analytics – New Course</td>
</tr>
<tr>
<td></td>
<td>MBAN 5120 (1.50) Data Management &amp; Programming I – to be expanded</td>
<td>MBAN 5110 (3.00) Predictive Modelling I – Name Change</td>
</tr>
<tr>
<td></td>
<td>MBAN 5150 (3.00) Skills for Leadership – to be retired</td>
<td>MBAN 5330 (3.00) Applications in Big Data – New Course</td>
</tr>
<tr>
<td></td>
<td>OMIS 6000 (3.00) Models and Applications in Operational Research Electives (6.00)</td>
<td>MBAN 5120 (3.00) Data Management &amp; Programming – Name &amp; Content Change</td>
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<tr>
<td></td>
<td></td>
<td>MBAN 6300 (3.00) Case Analysis and Presentation Skills</td>
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### Table 1. Degree Requirements: Current & Proposed

In Appendices 2 and 3, we present the course descriptions for core (Appendix 2) and elective (Appendix 3) courses. In Table 2, we present the relationship between the Expected Learning Outcomes and Program Structure. Below we itemize the list of new courses and changes to existing courses.

1. We propose to drop SB/MBAN 5150 from the program structure. Even though this course has been successful within the MBA Program, where it is taught as SB/MGMT 5150, we have found that it doesn’t have the same relevance to the MBAN students.

2. We propose to combine SB/MBAN 5120 1.50 Data Management & Programming I and SB/MBAN 5220 3.00 SB/Data Management & Programming II and change its name into SB/MBAN 5120 3.00, Data Management & Programming. This course is currently taught, and will continue to be taught by experts from SAS Institute. This change occurs in conjunction with the introduction of a new course, SB/MBAN 5330 3.00, Applications in Big Data. While Data Management focuses on cleaning and manipulating data using the classical techniques of SAS, SQL, and Hadoop, SB/MBAN 5330 focuses on Big Data applications such as Artificial Intelligence applications that enable data scientist to build models that would analyse data in real time. Our program shows another strong industry and academic alliance within this course. We will be collaborating extensively with IBM Thomas J. Watson Research Center for this course, and not only we will be getting access to computing power, and real life data, PhDs from this centre will present as guest lecturers in this course.

3. We propose to introduce a new course SB/MBAN 5140, Visual Analytics & Modelling. One of the newer requirements in business analytics is the ability to visualize complex data. According to Rick Smolan, the creator of the PBS documentary “The Human Face of Big Data”, the amount of data generated by humanity during the first day of a baby’s life is equivalent to 70 times of the information contained in the Library of Congress. As a result, analysing big data only in terms of

<table>
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<tr>
<th>TERM 2</th>
<th>TERM 3</th>
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<tbody>
<tr>
<td>MBAN 5220 (3.00) Data Management and Programming II – to be retired</td>
<td>MBAN 6090 (9.00) Major Research Project – to be restructured to run over two semesters and be worth 6.00 credits</td>
<td>MBAN 6090 6.0 Major Research Project (Structural Change)</td>
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<tr>
<td>MBAN 5250 (1.50) Analytics Consulting – to be retired</td>
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<tr>
<td>MBAN 6300 (3.00) Case Analysis and Presentation Skills</td>
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<td>MBAN 6400 (3.00) Multivariate Methods for Business Analytics</td>
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<tr>
<td>Electives (6.00) – to be contracted to 3 credits</td>
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<tr>
<td>MBAN 5210 (3.00) Predictive Modelling II – New Course</td>
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<tr>
<td>MBAN 6110 (3.00) Machine Learning I – Name Change</td>
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<tr>
<td>OMIS 6350 (3.00) Advanced Spreadsheet Modelling &amp; Programming for Business</td>
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<tr>
<td>MBA Elective I (3.00)</td>
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<tr>
<td>MBAN 6120 (3.00) Machine Learning II – Name Change</td>
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<tr>
<td>MBAN 6400 (3.00) Multivariate Methods for Business Analytics</td>
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<tr>
<td>MBA Elective II (3.00)</td>
<td>MBA Elective III (3.00)</td>
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statistical and machine learning techniques is not enough to make it comprehensible. The results need to resonate with decision makers and other users of such information. The Visual Analytics course will enable our students to explain the results of their highly technical analyses through graphs and pictures. We secured strong support from one of the leading data visualization companies, Tableau Incorporation (www.tableau.com), which will provide the software. The course will be taught by the data visualization instructors from the Information Design Department at York University.

4. We propose to expand SB/MBAN 5110 3.00, Introduction to Predictive Modelling to a series of two courses, SB/MBAN 5110 3.00, Predictive Modelling I, and SB/MBAN 5210 3.00, Predictive Modelling II. In Predictive Modelling I, we will cover topics such as Decision Trees, and Logistic Regression, while in Predictive Modelling II we will cover more advanced topics such as forecasting, time-series analysis, and repeated measures.

5. We propose to change the names of SB/MBAN 6110 3.00 & 6120 3.00 from Data Science I and II to Machine Learning I & II. The advisory board believes that the course titles should be more prescriptive of what is taught in the courses to help recruiters make informed decisions while hiring our students. The renamed courses will become core, rather than elective courses.

6. We propose to make SB/OMIS 6350 3.00 Advanced Spreadsheet Modelling & Programming for Business a required course. This course is currently a quantitative elective in the program. However, approximately 90% of our students take this course regularly, and feedback indicates that it is essential for our students’ success in placements and further advancement in their careers.

7. We propose to make SB/OMIS 6000 3.00 Models and Applications in Operational Research an elective course. The feedback that we received from the Advisory Board indicated that our program should enhance the Predictive Analytics portion of the program rather than Prescriptive Analytics applications. As a result, in order to provide our students more in depth applications in Predictive Analytics, we chose to convert OMIS 6000, which covers linear optimization and simulation applications to an elective course. Linear Optimization is indeed a Prescriptive Analytics application, and as a result we decided to provide this course to students who are really interested in this topic.

8. We also propose to remove SB/MBAN 5250 1.50 Analytics Consulting from the curriculum. This course was originally introduced to provide insights about how consulting projects are run to our MBAN students. However, we started covering most of the topics in the Big Data Workshop and our students are getting first hand consulting experience in the new MBAN 6090 course.

9. Another major change in the program is restructuring of the Major Research Project, SB/MBAN 6090 9.00. Currently, this course runs as a capstone course in the summer term. The new version would stretch the course (as a 6.00 credit version) over terms 2 and 3, similar to the MRP in the MBA and IMBA programs. This would allow students to do more substantial work as it often takes time to collect and clean data. It also allows us to expand the number of courses in order to complement the capabilities offered through the current version of the program. Even though, we are changing this course from a placement to a community-involved service project, the new version still will retain the experiential nature of the course as well as students’ exposure to the analytics industry.

10. The Marketing and Supply Chain Management streams will be removed from the program as students will no longer be required to choose electives from a set of quantitative versus managerial courses. Instead, students will be free to choose any of the courses listed in Appendix 3 (this list is subject to change via approval by the program director).
## Table 2: Relationship between Expected Learning Outcomes and Program Structure

<table>
<thead>
<tr>
<th>Expected Learning Outcomes</th>
<th>How are the Learning Objectives achieved?</th>
</tr>
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<tbody>
<tr>
<td><strong>1. Breadth and Depth of Knowledge</strong></td>
<td></td>
</tr>
<tr>
<td>Be knowledgeable in a wide range of business analytics topics, and be able to converse intelligently with a variety of professionals in different job functions.</td>
<td>These objectives are achieved through twelve 3.00 credit courses, all in business analytics or in a related function (e.g., statistics, operations research, marketing research, etc.). As well, the MBAN 6090 enables students to either study a topic in business analytics in detail or work on a specific analytics project within an organization.</td>
</tr>
<tr>
<td>Be able to conduct competent business analytics projects in a variety of job functions.</td>
<td>In addition to these courses, the electives offer students a chance to explore specific functional areas in business and deepen their knowledge within these areas.</td>
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<tr>
<td><strong>2. Research and Scholarship</strong></td>
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<tr>
<td>Be able to conduct research using readily available transactional level data that resides in various organizations, at a level expected in a business analyst role (or higher) in the private sector.</td>
<td>All courses have at least one group research project, and some assignments require individual student research. Originality and creativity are emphasized. The MBAN 6090 involves conducting in depth research using organizational data. Students are expected to draw upon empirical academic research to support their conclusions and recommendations.</td>
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<tr>
<td>Be able to generate well-structured and formatted research reports.</td>
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<tr>
<td>Have an appreciation of theoretical and empirical academic research in business analytics.</td>
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<tr>
<td>Be familiar with the top scholarly outlets in the field.</td>
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</tbody>
</table>
3. Level of application of knowledge

Be able to apply their knowledge to new applications, such as retention analysis, or a new method of market segmentation of new customers, etc.

Students are given opportunities through course-based research projects to explore different situations and are well equipped with the tools they need to apply their knowledge to new frontiers.

Besides coverage in the core courses, the 9.00 credit hours of electives will enable students to apply business analytics to a specific functional area and the MBAN 6090 will provide an industry specific context in which to work.

4. Professional capacity/autonomy

Graduates are expected to exercise good judgment and make informed decisions.

Students will be exposed to various scenarios in which experts need to make informed decisions and exercise good judgment on specific business analytics projects. This decision making involves consideration of technical questions, such as the appropriateness of data and methods, as well as intra- and inter-organizational political processes.

Graduates are expected to understand best practice and good governance while collecting and analyzing data.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>MBAN 5140</td>
<td>VISUAL ANALYTICS &amp; MODELLING</td>
</tr>
<tr>
<td>MBAN 5110</td>
<td>PREDICTIVE MODELLING I</td>
</tr>
<tr>
<td>MBAN 5330</td>
<td>PREDICTIVE MODELLING II</td>
</tr>
<tr>
<td>MBAN 5210</td>
<td>DATA MANAGEMENT &amp; PROGRAMMING</td>
</tr>
<tr>
<td>MBAN 6200</td>
<td>CASE ANALYSIS</td>
</tr>
<tr>
<td>MBAN 6120</td>
<td>MACHINE LEARNING I</td>
</tr>
<tr>
<td>MBAN 6110</td>
<td>MACHINE LEARNING II</td>
</tr>
<tr>
<td>OMIS 6350</td>
<td>ADVANCED SPREADSHEET MODELLING</td>
</tr>
<tr>
<td>MBAN 6090</td>
<td>RESEARCH PROJECT</td>
</tr>
<tr>
<td>MBAN 6200</td>
<td>MACHINE LEARNING II</td>
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<tr>
<td>MBAN 6400</td>
<td>MULTIVARIATE METHODS</td>
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<tr>
<td>5. Level of communication skills</td>
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<tr>
<td>Graduates are expected to be able to write concise, well researched, professionally formatted and structured reports.</td>
<td>Students have group presentations in the majority of their courses in the program. Presentation style and skills are honed. In addition, MBAN 6300 course focuses on Case Analysis and Presentation Skills. In all of the courses, class participation is encouraged and is a graded component of many courses.</td>
</tr>
<tr>
<td>Graduates are expected to be able to present, communicate, and market ideas clearly and effectively.</td>
<td>The consolidation of these learning outcomes occurs in the MBAN 6090. Students are required to produce an articulate and well-formatted presentation that summarizes the research they have completed at an organization or on a business analytics research study.</td>
</tr>
<tr>
<td>Graduates are expected to be able to put together effective and professional presentations.</td>
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<tr>
<td>6. Awareness of limits of knowledge</td>
<td>These objectives are achieved through the presentation and discussion of alternative schools of thought in statistical applications.</td>
</tr>
<tr>
<td>Be cognizant of the limitations of theoretical models and empirical findings.</td>
<td>The MBAN 5250, MBAN 6400, MBAN 6110 &amp; 6120 courses as well as the MBAN 6090 will provide case specific contexts in which theoretical models will be tested.</td>
</tr>
</tbody>
</table>
c) An overview of the consultation undertaken with relevant academic units and an assessment of the impact of the modifications on other programs/graduate diplomas. (Where and as appropriate, the proposal must include statements from the relevant program/graduate diplomas confirming consultation/support.)

The current format of the program allows students to take maximum one AP/ECON course and/or maximum five SC/MATH courses as electives. A SLIM report covering AY 2009 to today indicates that MBAN students have never taken the ECON course and made rare use of only two of the five MATH courses accessible to them (MATH 6627 in 2014 and MATH 6911 in 2015). We consulted with the chair of the MATH department, and he has no problem with the program dropping these courses from its list of electives. There are no resource implications for the MATH or ECON departments.

Inside Schulich, the relevant academic areas were consulted, as were administrative units (i.e., the career centre, student services and graduate admissions).

d) A summary of any resource implications and how they are being addressed. (Attention should be paid to whether the proposed changes will be supported by a reallocation of existing resources or if new/additional resources are required. If new/additional resources are required, the proposal must include a statement from the relevant Dean(s)/Principal.)

The restructured program calls for converting three elective courses into core courses (MBAN 6110, MBAN 6120, and OMIS 6350). Also, we will convert the 3rd term MRP (MBAN 6090) from a 9.00 credit to a 6.00 credit course, make OMIS 6000 3.00 an elective, and retire MBAN 5250 1.50 from the program. As a result, resources are not significantly impacted.

e) A summary of how students currently enrolled in the program/graduate diploma will be accommodated.

Current students or those admitted into the program in 2017/18 will not be affected as they are expected to graduate after Summer 2018 under the current program structure. The Summer 2018 intake will commence their studies using the new program structure. Any student that may start in 2017/18 and – against all odds – carry over into 2018/19 will be accommodated through course substitutions where appropriate.

4. Calendar Copy
   
   Same as before.

<table>
<thead>
<tr>
<th>Existing Program/Graduate Diploma Information (change from)</th>
<th>Proposed Program/Graduate Diploma Information (change to)</th>
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<tbody>
<tr>
<td>The Master of Business Analytics (MBAN) is a professional degree program designed to provide students with the breadth and depth of knowledge to be successful in a wide range of careers in areas such as banking, insurance, marketing, consulting, supply chain management, healthcare, and large technology firms. The MSBA may also serve as a foundation to pursue a PhD in this field. Students will gain a conceptual understanding and methodological competence of established techniques in business analytics which are used to create and interpret data.</td>
<td>No change.</td>
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</tbody>
</table>
knowledge in various business environments. They will be able to address complex issues using quantitative methodologies and create value for organizations using business analytics as a key measurement of performance and organizational planning. Graduates will understand how to apply business analytics to generate solutions which balance time, resources and complexity. This will possess a skill set that is both quantitative and qualitative, with the technical competence to analyse data coupled with the skills required to communicate effectively.

An undergraduate degree from a recognized postsecondary institution with a minimum B+ average in the last two full years (or equivalent) of academic work. Three-year cycle undergraduate degrees from institutions that meet the criteria set forth in the Bologna Declaration may be acceptable as the equivalent of an undergraduate honours degree.

Acceptable scores on all measures of the GMAT or GRE, or a degree from Schulich with a GPA of B+ or better that was awarded no more than five years ago.

Proof of English language proficiency if prior studies were not completed in English: TOEFL (IBT): 100 with minimum component scores of 23 or IELTS: 7.0 overall with minimum component scores of 6.5.

Otherwise acceptable students who lack specific course content judged to be essential, as identified by the program director, may be required to complete additional coursework either prior to or in the early stage of their degree program in order to address identified deficiencies.
Appendix 1: Complete Program Level Expected Learning Outcomes

Degree level expectations and learning objectives

The Master of Business Analytics (MBAN) is a specialist business degree designed to provide students with the breadth and depth of knowledge to be successful in a wide range of careers in banking, insurance, marketing, supply chain management, and in health care. In today’s competitive world, one of the biggest gaps that needs to be addressed from a skills perspective is to train students that can address a business question, and understand how to apply business analytics to get to the answer that balances time, resources and complexity. Business Analytics is defined as the science of responding to individuals’ needs by providing them the product or service, at the right time, at the right price, with the help of business theory, analytical tools and data. Too often, graduates just do what they are told instead of understanding the organizational setting and developing an appropriate solution based on the real need. In addition to the analytical training, finding ways to help our graduates understand the real issues by giving them the tools to analyze business processes is a critical outcome of this program. This requires both quantitative and qualitative skills. In addition to focusing on the theory and practice of statistics and operations research fundamentals, the program emphasizes responsible and ethical behavior.

Overall Expected Learning Outcomes:

Graduates of this field are expected to be able to:

a. employ advanced business analytics techniques to conduct projects in order to understand customer and transactional data;

b. communicate with organizations about data requirements for business analytics projects;

c. gather data and build Model Data Files that will be used in analytics projects;

d. conduct projects ethically when accessing, analyzing and reporting the results of Business Analytics projects.

Expectations and Objectives

1. Breadth and depth of knowledge

Graduates are expected to be:

a. knowledgeable in a wide range of business analytics topics (retention analytics, customer segmentation, etc), and be able to converse intelligently with a variety of professionals in different job functions;

b. able to conduct competent business analytics projects in a variety of job functions.

The above objectives are achieved through 22.50 credit-hour courses, all in business analytics or in a related function (e.g., statistics, operations research, marketing research, etc.), as well as through the capstone Analytics Consulting Project, which enables the students to work on a specific analytics project in order to gain real world experience.

2. Research and scholarship

Graduates are expected to:

a. be able to conduct research using readily available transactional level data that resides in various organizations, at a level expected in a business analyst role (or higher) in the private sector;

b. be able to generate well-structured and formatted research reports;

c. have an appreciation of theoretical and empirical academic research in business analytics;

d. be familiar with the top scholarly outlets in the field.
While a master's thesis is not a requirement in the program, all required courses have a research component. All courses have at least one group research project, and some assignments require individual student research. Originality and creativity are emphasized.

3. Level of application of knowledge
Business Analytics is a dynamic and evolving field, with an ever-changing set of issues and challenges. Graduates are expected to:
   a. be able to apply their knowledge to new applications, such as retention analysis, or a new method of market segmentation of the new customers, etc.

Students are given many opportunities in their course based research projects to explore different situations and are well equipped with the tools they need to apply their knowledge to new frontiers.

4. Professional capacity/autonomy
Graduates are expected to:
   a. exercise good judgment and make informed decisions;
   b. understand best practice and good governance while collecting and analyzing data.

5. Level of communication skills
Graduates are expected to be able to:
   a. write concise, well researched and professionally formatted and structured reports;
   b. present, communicate, and market ideas clearly and effectively;
   c. put together effective and professional presentations.

Students have group presentations in the majority of their courses in the program. Presentation skills are honed. Twice in the fall term, individual feedback is provided by the Program Director to help students develop an appropriate presentation style for the business analytics sector. In addition, class participation is encouraged in all classes.

6. Awareness of limits of knowledge
Graduates are expected to be:
   a. cognizant of the limitations of theoretical models and empirical findings;
   b. aware of different schools of thought in statistical applications.

The above objectives are achieved through research seminars (which are jointly attended by faculty and PhD students), and the presentation of alternative models.
Appendix 2: Descriptions of Core Courses

**SB/MBAN 6090 6.00: Analytics Consulting Project**  (Course credit, title and description change)
The Analytics Consulting Project is the capstone integrative course of the MBAN program. It will allow students to deepen their understanding of the subject matter and methodologies, as well as provide an opportunity for hands-on, problem-driven research and application. It is an intensive, 2 term project where groups of 4 MBAN students undertake a comprehensive analytics project of an organization (“client site”) and provide business insights to enhance the site’s future success. At the conclusion of the analytics consulting project students submit and present their final work to a panel of at least two experts, including the course director, and also to the client site.

**SB/MBAN 5110 3.00: Predictive Modeling I** (Course title change)
This course provides the tools needed to build models from data sets, validate models, and make predictions. The course emphasizes the SAS environment. Major areas for discussion include analysis of variance, regression, categorical data analysis, and predictive modelling. The course emphasizes both theory and practice, allowing students to use statistical theory for purposes of business case analysis.

**SB/MBAN 5210 3.00: Predictive Modelling II** (New course)
This course provides advanced tools needed to build models from data sets, validate models, and make predictions. The course emphasizes the SAS environment. Major areas for discussion include analysis of variance, regression, decision trees, and predictive modelling. The course emphasizes both theory and practice, allowing students to use statistical theory for purposes of business case analysis.

**SB/MBAN 5250 1.50: Analytics Consulting**  (Course retirement)
The Analytics Consulting course provides a broad overview of key analytics disciplines in the real world. It exposes students to how analytics professionals plan, conduct, and implement analytics projects in varying industries and within different work-streams. The course allows students to see the real-life impact of analytics and observe the similarities in approaches and issues across business environments. This six-session course convenes every other week and focuses on five disciplines such as human resources management, supply chain management, marketing, finance, and insurance. A final lecture summarizes the course and introduces emerging applications of analytics and big data.

**SB/MBAN 5150 3.00: Skills for Leadership** (Course retirement)
This course develops the thinking and reflective skills required for leadership in a turbulent world. Drawing on complexity science, the course applies a multiple perspectives framework to challenge embedded assumptions and advance students’ ability to think creatively, analytically and strategically. Students learn to identify and reframe complex problems more effectively, and to develop and communicate actionable solutions compellingly.

**SB/MBAN 5220 3.00: Data Management & Programming II** (Course retirement)
The Data Management and Programming II course examines advanced techniques for manipulating data. The course emphasises the SAS environment. Major areas for discussion include controlling input and output, summarizing data, data transformations, and debugging.

**SB/MBAN 5140 3.00: Visual Analytics & Modelling** (New course)
This course is an introduction to the fundamental theories of visual communication design applied in data visualization and visual analytics. Students become familiar with data-driven decision making workflows and storytelling best practices. Major areas for discussion include visual design principals, data structures, taxonomy of data visualization models and weekly technical tutorials using the Tableau software.

**SB/MBAN 5330 3.00: Applications in Big Data** (New course)
This course establishes a foundation for data science in the business domain. Through in-class lecturing and hands-on projects, students learn fundamentals of data, data management and data-centric programming. The classes cover up-to-date applications in data science, such as Python, SQL and Hadoop.

**SB/MBAN 5120 1.50: Data Management & Programming** (Course title, description, and credit change)
The Data Management and Programming course examines advanced techniques for manipulating data. The course emphasises the SAS environment. Major areas for discussion include controlling input and output, summarizing data, data transformations, and debugging.

**SB/MBAN 6110 3.00: Machine Learning I** (Course title change)
This course is an introduction to machine learning techniques designed for students who will work with data scientists or invest in related ventures. The course introduces fundamental concepts and techniques for the analysis of data-centered business problems, the creation and evaluation of solutions, the data science strategies, the basic cycle of a data-mining project, and the integration into business strategies.

**SB/MBAN 6120 3.00: Machine Learning II** (Course title and description change)
This course is designed for business students who will pursue a career in the related industries. The course first teaches students Unix command line and Python programming language, which constitute the uniform computing environment for the following topics: data visualization; predictive modelling; relational database and SQL; Web APIs; big data, Hadoop and MapReduce; and Stochastic Search and Optimization methods. Towards the end of the course, various business cases from data since are introduced; examples may include: (i) online recommender systems; and (ii) Online targeted display advertising. Through in-class labs, the course gives students hands-on experience of advanced data science techniques. Students are required to bring own laptop to participate these in-class labs.

**SB/MBAN 6300 3.00: Case Analysis and Presentation Skills**
This course is designed to give students the opportunity to practice and develop their analytical thinking and presentation skills. The key objective of the course is to train students to participate successfully in national and international case competitions. A secondary objective is to prepare students to successfully interview for management consulting positions. Second year MBA students who enjoy analyzing cases and delivering presentations are encouraged to take the course.

**SB/MBAN 6400 3.00: Multivariate Methods for Business Analytics**
This course covers fundamental issues in various statistical methods. The course includes topics such as partialling and statistical control, interaction effects and multi-group analyses, curvilinear and piecewise linear effects, cluster analyses, multivariate regression and canonical correlation.

**SB/OMIS 6350 3.00: Advanced Spreadsheet Modeling & Programming for Business**
This course enables the design, development, and implementation of integrated business analysis systems by combining the extended functionality of spreadsheets with the Visual Basic for Applications (VBA) programming language. The course demonstrates the power of combining the advanced analysis and modelling techniques of spreadsheets and VBA through applications to several practical problems from disparate business functions.
Appendix 3: MBA Electives

SB/OMIS 6000 3.00: Models and Applications in Operational Research
This course provides a survey of selected topics in operational research (OR). Emphasis is placed on the practical application of OR tools rather than on the mathematical properties. Application areas include: financial planning and portfolio selection, production, priority planning and marketing. Topics include: linear programming and its applications; programming to achieve a set of goals or targets with applications in finance and production; capital budgeting and project selection; transportation and network models; and portfolio models.

SB/ECON 6210 3.00: Economic Forecasting and Analysis
An increasing number of organizations make explicit forecasts of the economic environment within which they will be operating as a basis for forward-looking plans. This course studies the main forecasting methods in relation to the length of the forecasting time horizon. Several systematic appraisals of past forecasts are reviewed.

SB/FINE 6310 3.00: Econometrics of Financial Markets
This empirical methods course focuses on the statistical techniques that are most often used in the analysis of financial markets. The list of topics include: statistical properties of asset returns, tests of asset pricing models, efficient market hypothesis, event study methodology, simulation methods, panel data analysis, and volatility estimation such as GARCH, value-at-risk, and time-varying correlations.

SB/MKTG 6050 3.00: Marketing Research
This course develops a managerial appreciation toward marketing research. The steps of the research process are delineated, starting from recognizing and specifying the informational needs of the decision-maker and definition of the problem, through research design, sample selection, preparation of the instrument, data collection, data reduction, analysis, presentation and follow-up. Integration of the concepts discussed is achieved through considering the broader requirements of a marketing information system. The method of instruction includes cases, discussion of readings and use of computer analysis packages. A major term project is required.

SB/ACTG 5210 1.50: Management Accounting
This course provides an introduction to management accounting techniques that are useful in management decision-making situations such as cost management, pricing special orders, determining service levels and performance appraisal. The non-applicability of external reporting figures for most management decisions is reviewed.

SB/ACTG 6350 1.50: Advanced Cost and Management Accounting
This course develops problem-solving skills for internal accounting applications. Topics covered include product mix decisions, managing scarce resources, product costing and pricing, budgeting, and international transfer pricing.

SB/FNSV 6700 3.00: Management of Risk in Canadian Financial Institutions
Risk is the fundamental element that influences the behaviour of financial institutions. FNSV 6700 provides a comprehensive introduction to risk management. Presented within the framework of financial institutions, the course covers the design and operation of a risk-management system, modelling and the interplay between internal oversight and external regulation. The theory of risk management (market, credit and operational risk) comes alive through practical case evaluation and presentations from senior executives in the risk management field. The course provides the essential analytical foundations of risk management in a way appropriate for those who do not have a mathematical background.

SB/FNSV 6990 1.50: Enterprise Risk Management and Strategy
Strategy and risk management are two sides of value creation for companies. Strategic choice must identify how these choices affect a broad array of stakeholders. A firm must be organized to recognize, measure, monitor, and disclose risks if it is to implement its strategy. This course will focus upon the strategic importance of risk management rather than more technical aspects.

SB/MGMT 6700 3.00: Project Management
This course covers the strategic, organizational and operational aspects of managing projects. Students learn to manage the technical, behavioural, political and cultural aspects of temporary groups performing unique tasks. Topics covered include: defining deliverables, formulating project strategy, effective group organization and management, dynamically allocating resources, managing without authority, and resolving conflict. Traditional cost and time management techniques are covered using contemporary software packages.

SB/MKTG 6150 3.00: Consumer Behavior
This course assists students in developing a thorough understanding of the behaviour of both organizational buyers and end consumers. The psychological, sociological, organizational and environmental factors that shape buyer behaviour are reviewed. Throughout the course, the implications for both marketing strategies and tactics are addressed.

SB/MKTG 6250 3.00: Business Marketing
The course explores the management of inter-firm relationships in a supply chain context, encompassing both supplier-manufacturer relationships, and the relationships between manufacturers and channel intermediaries. Students learn to see these relationships as strategic combinations of market competition, power and trust. Topics covered include firm buying behaviour, the design of distribution channels, strategic implications of forward and backward vertical integration, various technology applications in SCM, and franchising.

SB/MKTG 6300 3.00: Service Marketing
This course examines the need for marketing in service industries, and develops an understanding of the ways in which service marketing differs from product marketing, and improves students’ understanding of how service characteristics affect the marketing function. Students learn to develop and implement marketing plans for service organizations.

SB/MKTG 6360 3.00: Marketing Metrics
This course focuses on developing the analytical skills required to successfully apply the principles of quantitative analysis to the marketing discipline. Students will learn the most common measurement methods currently being used in the marketing field.

SB/OMIS 6500 3.00: Global Operations and Information Management
Plant location, supplier selection and product and process development are no longer solely national issues. Hence, the first part of this course, we give an overview of global operations, including global supply chain management, network design for global operations and global entry strategies. This deals with how the use of information technology supports the management of global operations. Topics include value chain management, the concept of marketspace, business-to-business e-commerce, enterprise resource planning, and the effect of IT on R&D and collaboration, all in an international context.

SB/OMIS 6560 3.00: Supply Chain Management
This course is about how to make decisions that lead to the better design and management of supply chains. This often involves changing the network of relationships between suppliers and customers and other stakeholders as they design, contract, order, plan and coordinate goods and services together. This course covers essential quantitative supply chain management models, supportive information and
ecommerce technologies, environmentally and socially responsible practices and customer-supplier relationship management.

**SB/OMIS 6955 3.00: Service Operations Management**
This course is about designing and implementing service processes that respond effectively to customer requirements. Service processes involve high customer interaction, information-intensive products and the requirement for real-time responsiveness to a wide variety of customer demands. Designing, implementing and maintaining these processes in a competitive environment requires service-oriented organizations to have a new level of competence. This course concentrates on the problems and opportunities found in large companies in rapidly changing industries such as financial services. Best practice and generic problems in service delivery can be found in many industries, from manufacturing to retailing. Identifying effective strategies as well as specific techniques for process planning and control and project implementation are important in the development of managerial competence in service operations.

**SB/ORGS 6350 3.00: Managing Change**
As the environment of many business and non-profit organizations becomes increasingly complex and unstable, it is imperative that top managers be able to create a climate of flexibility and adaptability in their operations. This course surveys the major methods available to the modern manager for effectively managing the process of change and creating a general climate in which needed changes are sought and welcomed throughout the organization. The course emphasizes case studies and the discussion of alternative change-management models.

**SB/ORGS 6500 3.00: Interpersonal Managerial Skills**
Research demonstrates that people and their ability to work effectively together are critical success factors for organizations. This course focuses on specific personal and interpersonal skills for organizational (and professional) effectiveness. With an emphasis on experiential exercises, the course helps students develop skills such as communication; time, conflict and stress management; performance management; gaining influence; and self-awareness (including emotional intelligence).

**SB/ORGS 6560 3.00: Negotiations**
This course will provide students with insight into their own negotiation style and how to become a more effective negotiator. The course takes an experiential approach to exploring the concepts, theories, and psychology of negotiations. Students will gain knowledge of the different approaches to negotiations and the strategies and tactics unique to each. The course will provide students with opportunity to learn, practice and refine negotiation skills as well as equip them with the skills necessary to negotiate constructive resolution to conflict in the workplace.

**SB/SGMT 6000 3.00: Strategic Management**
This course examines business and corporate strategy. The focus is on strategic management, the process of choosing and defining purposes and objectives, formulating and implementing a viable strategy and monitoring strategic performance. It deals with the organization in its totality and demonstrates how and why the various functions of business are interdependent and need to be coordinated if the organization is to perform effectively. The course elaborates on the applicability of the strategic management discipline to a variety of sizes and types of organizations.

**SB/SGMT 6250 3.00: Strategy Execution**
This course addresses the managerial challenge of executing a firm’s strategy, by focusing on organizational elements that must be aligned to support a strategy as well as the tremendous difficulty of doing so. These elements include, but are not limited to, organizational structures and control mechanisms that “match” the given strategy as well as strategic leadership. Students learn and apply theory regarding strategy execution by analyzing implementation and performance in specific firms.
SB/SGMT 6700 3.00: Strategic Capabilities Development

We bridge and extend SGMT 6000 and ORGS 5100, drawing on contemporary theory and practice to further develop the skills and knowledge needed for translating strategy into action. Strategic successes and challenges are viewed as opportunities for building and strengthening long-run dynamic strategic capabilities. Emphasis is placed on experiential and applied approaches.
Appendix 5: Consultation with MATH

From: "Mike Zabrocki" <zabrocki@mathstat.yorku.ca>
Date: November 16, 2016 at 11:32:52 AM EST
To: "Murat Kristal" <mkristal@schulich.yorku.ca>
Subject: Re: Consultation re. Program Change

Hi Murat,

I don’t see any reason our program should object if you need to remove any of the courses from an elective list. Those decisions should be made to maintain the integrity of your program and they do seem appropriate in this case.

You should definitely delete MATH 6901 from the list because that course was deleted a few years ago and replaced with another.

The enrollment pressures on MATH 6910 and MATH 6911 make those courses difficult to get into unless they are required for the program.

-Mike

On Tue, Nov 15, 2016 at 6:12 PM, Murat Kristal <mkristal@schulich.yorku.ca> wrote:

Hi Mike:

I hope you are doing well. Please allow me to introduce myself. I am the Program Director of the Master of Business Analytics at Schulich.

I am in the process of finalising a change in the Master of Business Analytics program for submission to the relevant committees at Schulich and FGS. Feedback from employers indicates that we need to add further courses to the program, and this will have to come at the expense of the number of electives students are able to take. As you may remember, we currently have five MATH electives listed in the program, among other electives:

- MATH 6627 - Practicum in Statistical Consulting
- MATH 6633 - Introduction to the Theory and Methods of Time Series Analysis
- MATH 6901 - Operations Research II
- MATH 6910 - Stochastic Calculus in Finance
- MATH 6911 - Numerical Methods in Finance

My AD ran a report and found that two students took 6627 in AY 2014 and 3 students took 6911 in 2015. None of the MBAN students took any of the other courses. I know that you are at capacity with 6911 already, given the demand from our joint Financial Engineering program. Would you be OK if I dropped the MATH electives from the MBAN program?

Thank you,

Murat Kristal, PhD
Associate Professor
Program Director, Master of Business Analytics
Operations Management & Information Systems
Schulich School of Business
York University
Toronto, Ontario
Canada