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***SUBMITTED TO OUCQA FOR INFORMATION – March 25, 2020***

***APPROVED BY TRENT UNIVERSITY’S SENATE COMMITTEE – November 26, 2019***

# Final Assessment Report & Implementation Plan

# Applied Modeling and Quantitative Methods MA & MSc

# Completed by the Cyclical Program Review Committee (CPRC)

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| **Degree Programs Being Reviewed** | **MA & MSc Applied Modeling and Quantitative Methods** |
| **External Reviewers** | **Dr. G. Cynthia Fekken, Queen’s University**  **Dr. Steven Wang, York University** |
| **Internal Representative** | **Dr. Byron Lew, Economics, Trent University** |
| **Year of Review** | **2018-2019** |
| **Date of Site Visit** | **March 18 & 19, 2019** |
| **Due Date for Implementation Report by the Program** | **October 1, 2020** |
| **Date of Next Cyclical Review** | **2026-2027** |
| **Date Prepared by CPRC** | **October 16, 2019** |
| **Date Approved by Provost & VP Academic** | **November 13, 2019** |
| **Signature of Provost & VP Academic** | **Provost Muldoon** |

The MA and MSc Applied Modelling and Quantitative Methods is one of the oldest graduate programs at Trent University. It is an interdisciplinary program in the application of techniques and theory of modelling in the natural sciences and social sciences. The Program offers two course-based streams, Big Data Analytics and Financial Analytics, and a thesis-based stream offering an MA or MSc.

Trent is one of the first universities in Canada to fill the training gap for professionals in data science. Graduates of this program are uniquely prepared with the tools and skills to analyze today’s increasingly complex data sets in all areas of the sciences and business world, including the expanding field of Artificial Intelligence.

The program emphasizes practical skills in visualization, data mining, cloud-based approaches and parallel programming skill. Through seminars and collaboration, students develop the skills required to communicate with researchers outside their own discipline and develop a perspective not obtainable within a single-discipline context.

**Summary of Process**

During the 2018-2019 academic year, the MA and MSc Applied Modeling and Quantitative Methods programs underwent a review. Two arm’s-length external reviewers (Dr. G. Cynthia Fekken, Queen’s University and Dr. Steven Wang, York University) and one internal representative (Dr. Byron Lew, Economics, Trent University) were invited to review the self-study documentation. The site visit took place at the Peterborough campus on March 18 and 19, 2019.

This Final Assessment Report (FAR), in accordance with Trent University’s Institutional Quality Assurance Policy (IQAP), provides a synthesis of the cyclical review of the graduate degree programs. The report considers four evaluation documents: the Program’s Self-Study, the External Reviewers’ Report, the Program Response, and the Decanal Response.

A summary of the review process is as follows: the academic unit completed a self-study that addressed all components of the evaluation criteria as outlined in Trent’s IQAP. Appendices included: Curriculum Vitae, Course Syllabi, and a Library Statement of Support. Qualified external reviewers were invited to conduct a review of the program that involved a review of all relevant documentation (self-study, appendices, IQAP) in advance of the site visit. A two-day site visit took place where reviewers met with senior administration, faculty, and students.

Once the external reviewers’ report was received, both the Program and Dean provided responses to the Report. The Cyclical Program Review Committee (CPRC) reviewed and assessed the quality of the degree program based on the four review documents and reported on significant program strengths, opportunities for improvement and enhancement, and the implementation of recommendations.

The Implementation Plan identifies those recommendations selected for implementation and specifies the proposed follow-up and the person(s) responsible for leading the follow-up. Academic units, in consultation with the respective Dean(s), will submit an Implementation Report in response to the recommendations identified for follow-up. The Report is due October 1, 2020.

**Significant Program Strengths**

* The Program has had large success in the ability to attract students and increase enrolment rates through the introduction of the two course-based streams.
* The Program is unique to Ontario, offering students exposure to modelling techniques in a variety of disciplines normally inaccessible to students in a single graduate program.
* Faculty have strong research programs with an impressive array of external grants, internal awards and publications.

**Opportunities for Program Improvement and Enhancement**

* Enrolment in the AMOD program has grown substantially as a result of the two new streams in Big Data Analytics and Financial Analytics. Administration of the program, as well as courses and program requirements, needs to be reviewed to provide high quality student experience.
* The Program should provide further clarity to students regarding which courses will be offered in upcoming years.
* The introduction of more course-based streams in fields such as: Remote Sensing and Geographic Information Systems, Policy Analytics or Big Data in Health Sciences, will further increase enrolment.
* Consideration should be given to developing internship opportunities for all streams within the program.

**Complete List of Recommendations**

**Recommendation 1**

**That an ad hoc committee be appointed to develop a strategic plan for the Course Based AMOD programs. The Committee will consult with stakeholders to determine the optimal balance of program size, program structure and resources to be invested to sustain the program.**

**Program Response**

The Program agrees that strategic planning activities are necessary. Rather than an ad hoc committee approach, the Program recommends that the AMOD Director assemble a larger than usual executive committee to start this process. In particular, it will be important to draw on members of the major undergraduate units responsible for the delivery and maintenance of the program. A balance should be sought among program size and structure, and resources should be invested into a sustainable, long-term program which will bring benefits to Trent as a whole. Broad consultation should be part of the strategic planning activities.

**Decanal Response**

The Dean agrees with the Program’s response. The AMOD Director and Executive Committee are well-placed to start reviewing the program. The program should include representatives from the major undergraduate departments involved in the program. Consultation around resources should take place early in the process with the Graduate Dean and the Deans of Science and Social Science.

**Recommendation 2**

**That an adequately compensated Graduate Director and Executive Committee be appointed to manage the three AMOD programs. The Director and the Executive Committee should have the authority to negotiate with relevant departments/faculty members and develop relevant policies and procedures within the strategic plan while being held accountable to specific and identifiable academic leaders/administrative bodies.**

**Program Response**

The Program agrees with this recommendation and believes that this is one of the key issues to be addressed by the executive. The reviewers have left ‘adequate compensation’ to the discretion of the university, as is appropriate, however the unique size and complexity of the new AMOD makes it a very problematic program to support under the existing graduate compensation model. Compensation should be discussed as part of the strategic planning activities.

**Decanal Response**

The Dean agrees that this needs further discussion however there are limits to compensation as stipulated in the TUFA Collective Agreement. There may be additional supports or compensation that could be discussed with the appropriate Deans (Graduate, Science, Social Sciences) to ensure fair and equitable compensation.

Graduate programs already work with undergraduate departments and faculty and are encouraged to develop joint staffing plans that incorporate the teaching commitments of faculty members for the upcoming academic year.

**Recommendation 3**

**That the program develop explicit agreements outlining the expectations and compensation for teaching and supervising students in the three AMOD programs.**

**Program Response**

The Program agrees with this recommendation. As the collective agreement is up for negotiation this year, we feel strongly that this should be a matter taken under discussion, and a reasonable solution found that satisfies all relevant parties.

**Decanal Response**

The Dean agrees. Under the last TUFA CA, it was acknowledged that compensation for graduate activities be recognized. With a new TUFA CA being negotiated, it will be important to see how this new agreement might impact these discussions.

**Recommendation 4**

**That the degree requirements and the timelines for the two Course Based AMOD programs be synchronized:**

* 1. **Adopt a 12-month program for completing 6 course requirements and a research paper; consider the feasibility of an optional additional 4-month work/co-op term**
  2. **Develop a common first term for each of the AMOD Big Data Analytics and the AMOD Financial Analytics programs**
  3. **Make Statistical Aspects of Modelling a first term course for all course based AMOD students**

**Program Response**

The Program agrees with the core parts of these recommendations. Enrolments have grown dramatically and it is time to revisit the ordering of key courses and explore opportunities for more shared courses across all streams. The issue of 12 versus 16-month programs has important financial implications for the university, as well as for students. These issues should be discussed by the proposed AMOD Executive Committee in discussion with relevant stakeholders.

Regardless of whether a standard 12-month term is adopted, the AMOD program needs to expand course offerings in the Spring/Summer term and students need to know specific details about summer offerings at the start of the program (Fall term).

**Decanal Response**

The Dean agrees with the Program’s response. A 16-month program would be more beneficial to international students seeking a more straightforward immigration pathway. We have seen Financial Analytics students transferring into the Big Data stream because they want a 16-month program. It also creates problems marketing the 2 streams since having different lengths can be confusing to students.

The Program should try to unify the course-based times-to-completion to make it simpler to market and communicate the degree and its streams to potential students. The programs should be the same length, either 12 or 16 months.

**Recommendation 5**

**That curriculum be reviewed within and across each of the AMOD programs with goals of rationalizing the ‘ordering’ of courses, their content and learning outcomes, and minimizing redundancy**

* 1. **Reduce the total number of courses associated with the AMOD programs to a smaller comprehensive and cohesive grouping**
  2. **Review the Foundations of Modelling course with respect to course content, the current seminar approach and the pitch of the course as ‘foundational versus capstone’**
  3. **Coordinate programming languages and techniques needed to complete subsequent coursework and/or research**
  4. **Implement a mechanism that will allow Course Based AMOD students to identify their learning gaps early on and provide, at a minimum, a list of resources for self-directed remediation**
  5. **Implement a quality control mechanism across Reading Courses**

**Program Response**

AMOD faculty associated with Financial Analytics have recommended removing Linear Programming and streamlining Computational Finance to be a portion of a new, cross-stream course called Advanced Data Analytics. Such a course would encourage students to explore the wealth of possibilities in industry and academia for those with skills in computing, data analysis, and analytics.

The current AMOD Executive has already begun exploring the necessary rebuild and refocus of the Foundations of Modelling course. One thought presented was to emphasize aspects of programming in the course without explicitly forcing students into a path, leaving the R and Python introductions to the core courses (R in Statistical Aspects, Python in Computational Aspects).

**Decanal Response**

The Program should follow-up consider this under the newly developed Executive Committee (Rec #1). The Committee should review curriculum, minimize redundancy, and provide a cohesive curriculum to create a better student experience and streamline the administration of the program.

**Recommendation 6**

**That the research paper be maintained as a distinguishing feature of the AMOD Course Based programs and a structural change be made to manage the supervision of research papers (for example, using a Lab Course, Area Seminar, TAs, etc.)**

**Program Response**

The Program agrees with this recommendation and have already begun discussions with the relevant parties (in particular, the Deans of Science and Graduate Studies) to ensure sufficient resourcing is available for the coming year.

**Decanal Response**

The Dean agrees with the recommendation and encourages the Program to explore the feasibility.

**Recommendation 7**

**That administrative support be professionalized in proportion to the size of the AMOD programs**

1. **Invest resources in web based and other program advertising that sets out clear admissions criteria, attracts the best qualified applicants and fosters appropriate expectations for incoming students, especially about course offerings and timing.**
2. **Engage other units (e.g., the International Office, Student Advising Services, Graduate Office, etc.) to ensure the student experience meets the expectations set out in the strategic plan.**
3. **Add an annual review process for the Thesis Based AMOD students to facilitate timely completion of the thesis research.**

**Program Response**

The Program agrees that the rapid growth of AMOD will require long-term professional support, both on the administrative side, and on the course support and academic side.

1. The Program agrees that clear admissions criteria would assist with streamlining the process. In particular, the explicit criteria used to decide on admission for a given candidate. Course offerings and timing have been fluid due to staffing concerns and, going forward, we hope that AMOD can be more fixed with a number of courses being offered consistently (e.g., Statistical Aspects always offered in the Fall term, so that Econometrics in the Winter can require it as a prerequisite).
2. The Program agrees with this recommendation and hopes that senior administration can assist with this melding of units. This past year a member of the Executive arranged for a “CV Day” presentation, encouraging students to complete CVs which could then be made available to prospective employers.
3. There is currently a minimal review required annually, with a progress report filled out by the supervisor and signed by the student. It is worth noting that the time to completion rates for AMOD thesis students has shortened substantially in the most recent period.

**Decanal Response**

Part of this recommendation is dependent upon earlier recommendations. A communication plan can only be developed following a discussion of curriculum changes and program lengths. The Dean hopes that curriculum issues can be resolved this year and effectively communicated. The recruitment for a program like AMOD involves many initiatives including: website, Viewbook, webpointers, International recruiting agents, the International Office, and the Office of Graduate Studies. The Office of Graduate Studies is managing all of these issues.

As the Program matures in the next couple years, the Dean hopes that behind the scenes supports will evolve to create a seamless marketing and admissions experience for students.

**Implementation Plan**

The Implementation Plan provides a summary of the recommendations that require action. The Academic Unit in consultation with their Dean will be responsible for moving forward with the recommendations to ensure that each is completed within the recommended timeframe.

The Academic Unit will submit an Implementation Report to their Dean reporting on the completion and/or status of each recommendation. The Dean will review the Implementation Report prior to submitting the report to the Office of the Provost.

**DUE DATE FOR IMPLEMENTATION REPORT: OCTOBER 1, 2020**

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| **Recommendation** | **Proposed Follow-Up**  *If no follow-up is recommended, please clearly indicate ‘No follow up report is required’ and provide rationale.* | **Position Responsible for Leading Follow-up** |
| **Structure and Curriculum**  **Recommendation 1**  **That an ad hoc committee be appointed to develop a strategic plan for the Course Based AMOD programs. The Committee will consult with stakeholders to determine the optimal balance of program size, program structure and resources to be invested to sustain the program.**  **Recommendation 4**  **That the degree requirements and the timelines for the two Course Based AMOD programs be synchronized:**   1. **Adopt a 12-month program for completing 6 course requirements and a research paper; consider the feasibility of an optional additional 4-month work/co-op term** 2. **Develop a common first term for each of the AMOD Big Data Analytics and the AMOD Financial Analytics programs** 3. **Make Statistical Aspects of Modelling a first term course for all course based AMOD students**   **Recommendation 5**  **That curriculum be reviewed within and across each of the AMOD programs with goals of rationalizing the ‘ordering’ of courses, their content and learning outcomes, and minimizing redundancy**   1. **Reduce the total number of courses associated with the AMOD programs to a smaller comprehensive and cohesive grouping** 2. **Review the Foundations of Modelling course with respect to course content, the current seminar approach and the pitch of the course as ‘foundational versus capstone’** 3. **Coordinate programming languages and techniques needed to complete subsequent coursework and/or research** 4. **Implement a mechanism that will allow Course Based AMOD students to identify their learning gaps early on and provide, at a minimum, a list of resources for self-directed remediation** 5. **Implement a quality control mechanism across Reading Courses**   **Recommendation 6**  **That the research paper be maintained as a distinguishing feature of the AMOD Course Based programs and a structural change be made to manage the supervision of research papers (for example, using a Lab Course, Area Seminar, TAs, etc.)**  **Recommendation 7**  **That administrative support be professionalized in proportion to the size of the AMOD programs**   1. **Invest resources in web based and other program advertising that sets out clear admissions criteria, attracts the best qualified applicants and fosters appropriate expectations for incoming students, especially about course offerings and timing.** 2. **Engage other units (e.g., the International Office, Student Advising Services, Graduate Office, etc.) to ensure the student experience meets the expectations set out in the strategic plan.** 3. **Add an annual review process for the Thesis Based AMOD students to facilitate timely completion of the thesis research.** | Program to provide an update on the formation and work of the Executive Committee, including a strategic direction for the Course Based AMOD programs  The Committee should include representatives from the major undergraduate departments involved and consultation with the relevant undergrad Deans and the Graduate Dean should take place  As well, the Program should address Recommendations 4, 5, 6 and 7, all of which relate to the overall structure and curriculum of the program. | Director with Graduate Dean oversight |
| **Recommendation 2**  **That an**   1. **adequately compensated Graduate Director be appointed to manage the three AMOD programs** 2. **an Executive Committee be appointed to manage the three AMOD programs. The Director and the Executive Committee should have the authority to negotiate with relevant departments/faculty members and develop relevant policies and procedures within the strategic plan while being held accountable to specific and identifiable academic leaders/administrative bodies.** | 1. No follow up required.   Compensation of Graduate Director is governed by the relevant Collective Agreement.   1. Executive Committee – see Recommendation 1 |  |
| **Recommendation 3**  **That the program:**   1. **develop explicit agreements outlining the expectations for supervising students** 2. **compensation for teaching and supervising students in the three AMOD programs.** | 1. Program to provide update on how it has addressed the expectations of supervising students 2. No follow up required for compensation of teaching as this is governed by the relevant Collective Agreement | Director |