Assessment report
Limited Framework Programme Assessment

Bachelor Business Analytics

Vrije Universiteit Amsterdam

Contents of the report

1. Executive summary

In this executive summary, the panel presents the main considerations which led to the assessment of the quality of the Bachelor Business Analytics programme of Vrije Universiteit Amsterdam. The programme was assessed according to the standards of the limited framework, as laid down in the NVAO Assessment framework for the higher education accreditation system of the Netherlands, published on 20 December 2016 (Staatscourant nr. 69458).

The panel is positive about the programme objectives to educate students in the disciplines of mathematics, computer science and business administration and to train them in developing data-driven approaches to optimise business decisions. The panel supports students being trained in research skills and in a number of academic skills.

The panel considers the Domain-Specific Framework of Reference to be a satisfactory description of the business analytics domain at the bachelor level. The panel welcomes the efforts of the joint Mathematics programmes in the Netherlands to have drafted this Framework. The objectives and intended learning outcomes of this programme meet the Framework, but the panel finds it important to specify more clearly the relations between the business analytics domain and the mathematics discipline in the Framework.

The panel welcomes that students are educated to enrol in the master programmes in business analytics, but also in master programmes in other domains.

The intended learning outcomes of the programme correspond to the programme objectives. These intended learning outcomes are in accordance with the bachelor level.

The influx of students is appropriate. The panel approves of the admission requirements and entry procedures. Students are adequately informed about the challenging nature of the programme. In the first year, students are appropriately assisted in making the transition from secondary education to this university programme. The panel notes the programme meeting students' expectations.

The curriculum of the programme matches the intended learning outcomes. The panel regards the curriculum to be appropriate, students being taught mathematics, computer science and business administration subjects at required levels. The panel is positive about the projects being offered. The programme introduces students clearly to the professional dimensions of the subjects taught. The panel suggests to maintain and, where required, strengthen the relations with research. The History of Science and Philosophy course is appreciated by the panel, as are the programme plans to add ethics to this course.

The staff lecturing in the programme have solid research backgrounds in the fields they are lecturing in and are motivated teachers. Their educational capabilities are up to standard. The panel is positive about the strong relations between the Departments and the Faculty cooperating in the programme. The panel notes the appreciation of lecturers by students. As the work load of lecturers is rather challenging, the panel welcomes extra staff being recruited.

The educational concept and the study methods adopted in the programme are effective. The panel applauds the intensive and effective study guidance by the study advisor. The panel considers the material facilities for the programme to be satisfactory, in particular after the relocation to the new building. The drop-out rates and the student success rates of the programme are adequate.

The panel approves of the examinations and assessment rules and regulations of the programme, these being in line with Vrije Universiteit Amsterdam and Faculty of Science policies. The panel is positive about the position and the activities of the Examination board. The panel considers the measures taken by the programme to assure the quality of examinations and assessments to be appropriate.

The panel approves of the examination methods adopted by the programme. The examination methods are consistent with the goals of the courses. The processes of marking examinations are adequate. The policies to curtail any effects of free-riding are appropriate.

The supervision and assessment processes for Business Cases have been well-organised. The panel feels that groups of four to five students are quite large and, therefore, suggests to consider making these groups smaller. The panel is convinced, however, that the programme manages to achieve justified grades for individual students. The assessment procedures are up to standard, involving two examiners assessing the work separately. The panel, however, advises to add more extensive arguments to substantiate the assessments of the Bachelor projects. In addition, the panel suggests to add grades for the assessment criteria on the assessment forms.

The examinations of the courses are of appropriate level. The panel assesses the final projects, that is the Business Cases, to be up to standard. The quality of the Business Cases varies. The grades awarded to these are supported by the panel. No Business Cases were found to be unsatisfactory. As the mathematical models are not always represented in the written reports for the host organisations, the panel suggests to add these models as appendices to the reports.

The panel is convinced that the programme graduates have reached the intended learning outcomes of the programme. Programme graduates are admitted to quite a few master programmes.

The panel that conducted the assessment of the Bachelor Business Analytics programme of Vrije Universiteit Amsterdam assesses this programme to meet the standards of the limited framework, as laid down in the NVAO Assessment framework for the higher education accreditation system of the Netherlands, judging the programme to be *satisfactory*. Therefore, the panel recommends NVAO to accredit this programme.

Rotterdam, 30 September 2019

Prof. dr. ir. O.J. Boxma
(panel chair)

drs. W. Vercouteren
(panel secretary)

2. Assessment process

The evaluation agency Certiked VBI received the request by Vrije Universiteit Amsterdam to support the limited framework programme assessment process for the Bachelor Business Analytics programme of this University. The objective of the programme assessment process was to assess whether the programme conforms to the standards of the limited framework, as laid down in the NVAO Assessment framework for the higher education accreditation system of the Netherlands, published on 20 December 2016 (Staatscourant nr. 69458).

Management of the programmes in the assessment cluster WO Wiskunde convened to discuss the assessment panel composition and to draft the list of candidates. The panel composition for this assessment has been based upon these considerations.

Having conferred with Vrije Universiteit Amsterdam programme management, Certiked invited candidate panel members to sit on the assessment panel. The panel members agreed to do so. The panel composition was as follows:

- Prof. dr. ir. O.J. Boxma, full professor Stochastic Operations Research, Eindhoven University of Technology (panel chair);
- Prof. dr. R.H. Kaenders, full professor Mathematics and its Education, University of Bonn, Germany (panel member);
- Prof. dr. D. van Straten, full professor Algebraic Geometry, Johannes Gutenberg University Mainz, Germany (panel member);
- Dr. ir. H.J. Prins, manager Research & Development, Maritime Research Institute the Netherlands (panel member);
- Drs. J. Poppelaars, senior manager, practice leader Advanced Analytics, BearingPoint (panel member);
- S.R. den Breeijen MSc, recently graduated student Master Mathematics, Radboud University Nijmegen (student member).

On behalf of Certiked, drs. W. Vercouteren served as the process coordinator and secretary in the assessment process.

All panel members and the secretary confirmed in writing being impartial with regard to the programme to be assessed and observing the rules of confidentiality. Having obtained the authorisation by the University, Certiked requested the approval of NVAO of the proposed panel to conduct the assessment. NVAO have given their approval.

To prepare the assessment process, the process coordinator convened with management of the programme to discuss the planning of the activities in preparation of the site visit. The site visit schedule was also discussed. In addition, the outline of the self-assessment report and the subjects to be addressed in this report were part of the discussion.

In the course of the process preparing for the site visit, programme management and the Certiked process coordinator had contact to fine-tune the process. The activities prior to the site visit have been performed as planned. Programme management approved the site visit schedule.

Well in advance of the site visit date, programme management sent the list of final projects of graduates of the programme of the most recent years. Acting on behalf of the assessment panel, the process coordinator selected the final projects of fifteen graduates from these years. The grade distribution in the selection was conform to the grade distribution in the list, sent by programme management. The study modes of the programme were covered in the selection.

The panel chair and the panel members were sent in time the self-assessment report of the programme, including appendices. In the self-assessment report, the student chapter was included. In addition, the expert panel members were forwarded a number of theses of the programme graduates, these theses being part of the selection made by the process coordinator.

Before the site visit date, the assessment panel chair and the process coordinator met to discuss the self-assessment report to be provided by programme management, the procedures regarding the assessment process and the site visit schedule. In this meeting, the profile of panel chairs of NVAO was discussed as well. The panel chair was comprehensively informed about the competencies, listed in the profile.

Being informed by the process coordinator, all panel members sent in their preliminary findings, based on the self-assessment report and the final projects studied, and a number of questions to be put to the programme representatives on the day of the site visit. The panel secretary summarised this information, compiling a list of questions, which served as a starting point for the discussions with the programme representatives during the site visit.

Shortly before the site visit date, the panel met to go over the preliminary findings concerning the quality of the programme. During this meeting, the preliminary findings of the panel members, including those about the theses were discussed. The procedures to be adopted during the site visit, including the questions to be put to the programme representatives on the basis of the list compiled, were discussed as well.

On 17 June 2019, the panel conducted the site visit on the Vrije Universiteit Amsterdam campus. The site visit schedule was as planned. In a number of separate sessions, the panel was given the opportunity to meet with Faculty Board representatives, programme management, Examination board members, lecturers and final projects examiners, students, and alumni and professional field representatives.

In a closed session near the end of the site visit, the panel considered every one of the findings, weighed the considerations and arrived at conclusions with regard to the quality of the programme. At the end of the site visit, the panel chair presented a broad outline of the considerations and conclusions to programme representatives.

Clearly separated from the process of the programme assessment, the assessment panel members and programme representatives met to conduct the development dialogue, with the objective to discuss future developments of the programme.

The assessment draft report was finalised by the secretary, having taken into account the findings and considerations of the panel. The draft report was sent to the panel members, who studied it and made a number of changes. Thereupon, the secretary edited the final report. This report was presented to programme management to be corrected for factual inaccuracies. Programme management were given two weeks to respond. Having been corrected for these factual inaccuracies, the Certiked bureau sent the report to the University Board to accompany their request for re-accreditation of this programme.

3. Programme administrative information

Name programme in CROHO:	B Business Analytics
Orientation, level programme:	Academic Bachelor
Grade:	BSc
Number of credits:	180 EC
Specialisations:	None
Location:	Amsterdam
Mode of study:	Full-time, part-time
Language of instruction:	English
Registration in CROHO:	21PL-56856
Name of institution:	Vrije Universiteit Amsterdam
Status of institution:	Government-funded
Institution's quality assurance:	Approved

4. Findings, considerations and assessments per standard

4.1 Standard 1: Intended learning outcomes

The intended learning outcomes tie in with the level and orientation of the programme; they are geared to the expectations of the professional field, the discipline, and international requirements.

Findings
The Bachelor Business Analytics programme is one of the bachelor programmes of the Faculty of Science of Vrije Universiteit Amsterdam. The dean of the Faculty has the responsibility for all programmes of the Faculty. This Bachelor programme is part of the Bachelor College of Natural Sciences and Mathematics of this Faculty. The director of the programme is responsible for the contents, the organisation and the quality of the programme. The programme director is assisted by the programme coordinator and the academic advisor. The Programme committee for the Bachelor Business Analytics and Master Business Analytics programmes, being composed of equal numbers of lecturers and students, advises programme management on quality issues. Lecturers in the Programme committee come from both the Department of Mathematics and the Department of Computer Science. The Faculty-wide Examination board assures the quality of examinations and assessments of this programme. The sub-committee of this Faculty-wide board for the Mathematics and Business Analytics programmes has the responsibility to assure the quality of examinations and assessments of this programme.

The objectives of the programme are to provide students with broad knowledge, understanding and skills of data-driven approaches to optimise business decisions. These approaches involve statistical analysis of data, drafting of quantitative models and optimisation. The programme is multi-disciplinary and educates students in the disciplines of mathematics, computer science and, to a lesser extent, business administration. In terms of fields within the mathematics discipline, the programme is directed towards stochastics and operations research. Students are also trained in research skills and in academic skills. The latter include skills to work in multidisciplinary teams and communication skills.

The joint Mathematics programmes in the Netherlands, including this Bachelor Business Analytics programme, drafted the Domain-Specific Framework of Reference for this Bachelor Business Analytics programme. In this Domain-Specific Framework of Reference, the generic objectives and the generic intended learning outcomes for programmes in the domain of business analytics on bachelor level have been listed.

Compared to econometrics and operations research programmes, the programme is more strongly directed towards computer science concepts. In comparison to programmes in data science, or in industrial engineering, the programme is focussed more strongly on applied mathematics and on statistical or probabilistic modelling.

Students are not educated to directly enter the labour market, though some students may do. Students are prepared to continue their education at master level in business analytics, but also in disciplines such as applied mathematics, computer science, econometrics or artificial intelligence.

The objectives of the programme have been translated into the intended learning outcomes. These include, as main elements, thorough theoretical and practical knowledge of mathematics and computer science, as applied in commercial and industrial processes; some experience in modelling business processes using mathematical and computer science methods; basic research skills; skills to work in multidisciplinary teams; communication skills in this field; awareness of the role of mathematics, computer science and business economics in society; and knowing the opportunities for further studies or employment upon completion of this programme.

The intended learning outcomes of the programme have been compared to the Dublin descriptors for bachelor programmes, to establish their bachelor level.

Considerations
The panel is positive about the programme objectives to educate students in the disciplines of mathematics, computer science and business administration and to train them in developing data-driven approaches to optimise business decisions. The panel supports students being trained in research skills and in academic skills, such as skills to work in multidisciplinary teams and communication skills.

The panel considers the Domain-Specific Framework of Reference to be a satisfactory description of the business analytics domain at the bachelor level. The panel welcomes the efforts of the joint Mathematics programmes in the Netherlands to have drafted this Framework. The objectives and intended learning outcomes of this programme meet the Framework, but the panel thinks it is important to specify more clearly the relations between the business analytics domain and the mathematics discipline in the Framework.

The programme intentions to educate students to continue their studies at master level are supported by the panel. The panel welcomes students being educated to enrol in master programmes in business analytics, but also in master programmes in other domains.

The intended learning outcomes of the programme correspond to the programme objectives. These intended learning outcomes are in accordance with the bachelor level.

Assessment of this standard
These considerations have led the assessment panel to assess standard 1, Intended learning outcomes, to be satisfactory.

4.2 Standard 2: Teaching-learning environment

The curriculum, the teaching-learning environment and the quality of the teaching staff enable the incoming students to achieve the intended learning outcomes.

Findings
The number of students entering the programme increased from 82 students in 2013 to 140 students in 2017 to decrease slightly to 119 students in 2018. The intake is stabilising the last few years. The number of foreign students is rather stable at about 15 students per year. The programme wants to increase the number of foreign students to promote the international classroom. Some of the incoming students are part-time students, combining the study with their work. The entry requirements are the Dutch secondary school diploma, including the Mathematics B certificate. The entry requirements for foreign students are equivalent, be it that they have to report proficiency in English. On information days, the programme informs prospective students about the challenging nature of the curriculum. All students have to attend matching days either in person or on-line to reflect upon their decision to enter this programme. The programme assists students in making the transition from secondary education to university. Part of the first course *Introduction Business Analytics* are mentor groups to assist students in accommodating to university learning processes and to English-taught lectures. The mentors are lecturers in the course. Student mentors are also available to help students to become acquainted with the university environment and type of learning. In Calculus 1, one of the first courses in the curriculum, secondary education in mathematics is refreshed. Attendance in tutorials of the first courses in the curriculum is mandatory.

The study load of the curriculum is 180 EC. The curriculum takes three years to complete. Part-time students may take longer. Programme management presented a table, showing the curriculum to cover all of the intended learning outcomes. The years in the curriculum consist of disciplinary courses in mathematics, computer science or business administration and multidisciplinary projects at the end of the semesters. In the projects, disciplinary knowledge and skills are integrated, and students are trained in academic skills, such as drafting problem statements, analysing subjects, cooperating in teams, academic writing and oral presentations. The first year mainly consists of basic courses in mathematics. The second year includes courses on programming, stochastics, modelling, and data analysis. The third-year course *History of Science and Philosophy* addresses historical and philosophical dimensions of the disciplines in the programme. From the academic year 2019/2020 onwards, ethics components will be added to this course. The minor to be taken in the first semester of the third year (30 EC) may be the minor Business Analytics and Data Science offered by the programme, but may also be one of the minors offered by Vrije Universiteit Amsterdam or by other universities in the Netherlands or by institutions abroad. At the end of the curriculum, students complete the Bachelor project (12 EC). This project consists of three components, being *Study and Career*, *Scientific Writing in English* (3 EC together) and the *Business Case* (9 EC). The first two parts provide students with study or labour market orientation and train them in writing academic English. The Business case is the final project of the programme. Very talented and motivated students may take the honours programme of 30 EC, consisting of both departmental courses and university-wide courses.

The total number of permanent staff members lecturing in the Bachelor Business Analytics and Master Business Analytics is 44 lecturers representing 15.7 full-time equivalents of teaching capacity in total. Most of the lecturers in the programmes are staff members from the Department of Mathematics. In addition, lecturers from the Department of Computer Science of the Faculty of Science or from the School of Business and Economics of Vrije Universiteit Amsterdam are involved in the programme. Nearly all staff members are active researchers in their respective fields and practically all of them have PhD degrees. About 77 % of the staff members in the Department of Mathematics are BKO-certified. Others are in the process of obtaining the BKO-certificate. All permanent staff members are BKO-certified. Over 60 % of the lecturers from the Department of Computer Science and the School of Business and Economics have obtained the BKO-certificate. The junior lecturer Business Analytics is involved as teaching assistant or supervisor in most tutorials and projects in the first year. PhD students, postdoctoral researchers and senior master students lecture in tutorials or computer labs. They have been trained for this work. They are engaged in grading assignments and examinations, but only under the supervision of examiners. Lecturers meet monthly to discuss aspects of teaching in the programme. Lecturers are free to organise their lectures, as long as course goals are met. Students appreciate lecturers' capabilities and accessibility. Lecturers experience the work load as challenging. About eight new positions in the Department of Mathematics are being created, among others on account of the Mathematics sector plan. Additional positions will be created in the Department of Computer Science as well.

The programme educational concept is to foster students actively engaging in the learning processes, to teach them to address problems, mostly in teams and make the transition from theory to practice. Study methods adopted in the programme are lectures, tutorials, computer practice sessions, small case studies, projects, written and oral presentations and self-study. Lectures are combined with tutorials for mathematics courses, computer labs for computer science courses or working groups for business administration courses. The knowledge gained in these disciplinary courses is integrated in business case studies or projects, students in teams addressing problems in organisations. The business cases or projects require students to state problems, analyse subjects addressed, develop models and report orally and in writing on the findings and the results. Full-time students and part-time students collaborate. In tutorials, PhD students or teaching assistants are involved. Every one of the students meets with the academic advisor three times in the first year. The academic advisor informs them about and advises them on the programme. Students are invited to turn to the study advisor in case of problems. The average drop-out rate is 30 %, calculated for the last five years. The average student success rates are 50 % after three years and 80 % after four years (last cohort; proportions of students re-entering the programme in the second year).

Considerations
The panel considers the influx of students to be appropriate. The panel approves of the admission requirements and entry procedures of the programme. Students are adequately informed about the challenging nature of the programme. In the first year, students are appropriately assisted in making the transition from secondary education to this university programme. The panel notes that the programme meets students' expectations.

The curriculum of the programme matches the intended learning outcomes. The panel regards the curriculum to be appropriate, students in effect being taught mathematics, computer science and business administration subjects at required levels. The panel is positive about the projects being

offered in the curriculum. The programme introduces students clearly to the professional dimensions of the subjects taught. The panel suggests to maintain and, where required, strengthen the relations with research. The History of Science and Philosophy course is appreciated by the panel, as are the programme plans to add ethics to this course.

The staff lecturing in the programme have solid research backgrounds in the fields they are lecturing in and are motivated teachers. Their educational capabilities are up to standard. The panel is positive about the strong relations between the Departments and the Faculty cooperating in the programme. The panel notes the appreciation of lecturers by students. As the work load of lecturers is rather challenging, the panel welcomes extra staff being recruited.

The educational concept and the study methods adopted in the programme are regarded by the panel to be effective. The panel applauds the intensive and effective study guidance by the study advisor. The panel considers the material facilities for the programme to be satisfactory, in particular after the relocation to the new building. The drop-out rates and the student success rates of the programme are adequate.

Assessment of this standard
These considerations have led the assessment panel to assess standard 2, Teaching-learning environment, to be satisfactory.

4.3 Standard 3: Student assessment

The programme has an adequate system of student assessment in place.

Findings
The programme examination and assessment procedures are aligned with the Vrije Universiteit Amsterdam policies and the Faculty of Science policies. The examinations and assessments are governed by the principles of constructive alignment, linking the course examinations to the programme intended learning outcomes. As has been indicated, the Sub-examination board for Mathematics and Business Analytics monitors the quality of examinations and assessments of this programme. This board is part of the Faculty-wide Examination board.

The examination methods for the courses are selected in line with the courses' contents. The examination methods in the programme include written intermediate examinations, written final examinations, homework assignments, programming tests, written reports and oral presentations. In most of the courses, multiple examinations are scheduled. Programming tests are examination methods in computer science courses. Written reports and oral presentations are examination methods in projects. In the first year, intermediate examinations and homework assignments are scheduled with high frequency to promote students' study progress. Homework assignments may constitute no more than 40 % of the course grade to counter the effects of any free-riding. The written examinations have to be at least 60 % of the course grade. To pass courses, the grades of written examinations have to be at least 5 out of 10. Teaching assistants may be involved in marking course examinations, but only under examiners' supervision.

The Business Case parts of the Bachelor projects are organised by the course coordinator. The cases have to meet strict deadlines. The topics for these cases represent real-life business problems, proposed by organisations in the professional field and selected by programme staff. The Business Cases selected are addressed by groups of four to five students. These student groups have regular, mostly weekly meetings with their supervisor. During these meetings, individual group members give presentations on intermediate findings. At completion of the Business cases, the student groups submit their final written report and give the final presentation on the results to the host organisation. The Business Cases are assessed by two examiners separately, on the basis of a number of assessment criteria. Individual performances of group members are assessed by rating the individual contributions during meetings, in presentations and in reports, by interviews with individual group members at completion of the work, and by group members peer-reviewing each other's performances. Grades of all Business Cases are calibrated in discussions between all supervisors and the course coordinator.

Programme management and the Examination board have taken a number of measures to promote the quality of examinations and assessments. The Examination Board appoints two examiners for each of the courses. Course goals are drafted in clear terms. Draft examinations are peer-reviewed by fellow examiners. Examination matrices have been adopted. Answer models to mark examinations have to be submitted. The validity of examinations with pass rates of less than 50 % are checked by the Examination board. Students are entitled to inspect their marked examinations. Every year, the Examination board inspects 10 % of the course examinations, a number of Business Cases and a

number of Business Cases' assessment forms. Business Cases are all checked for plagiarism, unless issues with confidentiality emerge.

Considerations
The panel approves of the examinations and assessment rules and regulations of the programme, these being in line with Vrije Universiteit Amsterdam and Faculty of Science policies. The panel is positive about the position and the activities of the Examination board.

The panel approves of the examination methods adopted by the programme. The examination methods are consistent with the goals of the courses. The processes of marking examinations are adequate. The policies to curtail any effects of free-riding are appropriate.

The supervision and assessment processes for Business Cases have been well-organised. Students are offered appropriate supervision. The panel feels that groups of four to five students are quite large and, therefore, suggests to consider making these groups smaller. The panel is convinced, however, that the programme manages to achieve justified grades for individual students. The assessment procedures are up to standard, involving two examiners assessing the work separately. The panel, however, advises to add more extensive arguments to substantiate the assessments of the Bachelor projects. These may take the form of concise comments on the selection of the topic of the thesis, the preparation of the student on the subject concerned, the summary of the contents of the thesis, the specification of the own contributions by the student, the creativity and mathematical depth of the student contributions and the quality of writing and oral presentation by the student. In addition, the panel suggests to add grades for the assessment criteria on the assessment forms.

The panel considers the measures taken by the programme to assure the quality of examinations and assessments to be appropriate. The panel regards these measures as assuring valid, reliable and transparent examinations and assessments.

Assessment of this standard
The considerations have led the assessment panel to assess standard 3, Student assessment, to be satisfactory.

4.4 Standard 4: Achieved learning outcomes

The programme demonstrates that the intended learning outcomes are achieved.

Findings
The panel studied the examinations of a number of courses of the programme.

The panel reviewed the Business Cases of the Bachelor Projects of fifteen graduates of the programme with different grades, from both full-time students and part-time students. In the Business Cases, students are to demonstrate mastering all intended learning outcomes of the programme. They are in particular assessed on analytical skills, synthetic skills, creativity, taking initiative, social skills, writing skills and presentation skills. The average grade of the Business Cases is 7.8 for the graduates of the last two years.

In the curriculum, some activities are scheduled for students' labour market orientation. In projects, among which the Business Cases, students do assignments for organisations in the professional field. In addition, the Study and Career components of the Bachelor project allow students labour market orientation. From 2008 onwards, the Work field advisory board for the Mathematics and Business Analytics programmes, being composed of programme alumni and professional field representatives, advises programme management on the alignment of the programme with trends in the professional field.

Programme graduates tend not to enter the labour market. Programme graduates are admitted to a range of master programmes both in business analytics and in other disciplines, such as applied mathematics, computer science, econometrics, operations research or artificial intelligence. The proportion of graduates proceeding to the Master Business Analytics programme of Vrije Universiteit Amsterdam is about 75 % and the proportion of graduates going to the Master Econometrics and Operational Research of this university is 14 %.

Considerations
The examinations of the courses which were reviewed by the panel are of appropriate level.

The panel assesses the Business Cases to be up to standard. The quality of the Business Cases varies. The grades awarded to these are supported by the panel. No Business Cases were found to be unsatisfactory. As the mathematical models are not always represented in the written reports for the host organisations, the panel suggests to add these models as appendices to the reports.

The panel is convinced the programme graduates have reached the intended learning outcomes of the programme. Programme graduates are admitted to quite a few master programmes.

Assessment of this standard
The considerations have led the assessment panel to assess standard 4, Achieved learning outcomes, to be satisfactory.

5. Overview of assessments

Standard	Assessment
Standard 1. Intended learning outcomes	Satisfactory
Standard 2: Teaching-learning environment	Satisfactory
Standard 3: Student assessment	Satisfactory
Standard 4: Achieved learning outcomes	Satisfactory
Programme	Satisfactory

6. Recommendations

In this report, a number of recommendations by the panel has been listed. For the sake of clarity, these have been brought together below.

- To maintain and, where required, strengthen the relations with research in the curriculum.
- To consider making the groups of students for completing the Business Cases smaller than the current four to five students in these groups.
- To add more extensive comments and arguments to substantiate the assessments of the Business Cases.
- To add grades for the assessment criteria on the Business Cases' assessment forms.
- To present the mathematical models underlying the Business Cases as appendices to the written reports for the host organisations.