Master of Science in Information Systems

Kristiania University College (Høyskolen Kristiania AS)

April 2020

NOKUT

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NOKUT kontrollerer og bidrar til kvalitetsutvikling ved lærestedene. Dette gjør vi blant annet gjennom å akkreditere nye utdanningstilbud. Institusjonene som gir høyere utdanning har ulike fullmakter til å opprette nye studier. Dersom en institusjon ønsker å opprette et utdanningstilbud utenfor fullmaktsområdet sitt, må den søke NOKUT om dette.

Institution	Kristiania University College
The provisions name	Master of Science in Information Systems
Degree / Study points	Master / 120 ECTS
Delivery form	Campus based
Experts	Joachim Scholderer, Magnus Westerlund and Sondre Wold
Decision date	21.04.2020
NOKUTs case number	19/07338

NOKUT

Introduction

The external quality assurance performed by NOKUT consists of evaluating the institution's quality assurance systems, accreditation of new provisions and revision of accredited provisions. Universities and university colleges have different self-accrediting powers. For an institution without selfaccrediting powers to establish a provision in a certain cycle an application must be made to NOKUT.

Hereby NOKUT presents the accreditation report of master of science in information systems at Kristiania University. The expert evaluation in this report is part of the accreditation process following the institution's application for accreditation. This report clearly indicates the extensive evaluation performed to ensure the educational quality of the planned educational provision.

The master of science in information systems at Kristiania University College does fulfil the conditions for accreditation in the Regulation concerning NOKUT's supervision and control of the quality in Norwegian higher education.

Øystein Lund
director of the Department for Quality Assurance and Legal Affairs

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1 Information regarding the applicant institution

As an accredited university college, Kristiania University College has the power of self-accreditation for educational provisions at bachelor level (first cycle). Kristiania University College now applies for accreditation of Master of Science in Information Systems – 120 ECTS, with specialisation in Business Data Analytics. This master was accredited by NOKUT in 2011 for two other specialisations, Digital Business Systems and Management and Innovation. (NOKUT case number 11/200). The new specialisation has been evaluated in its entirety as new regulations were established in 2017. During the process the new specialisation was renamed Business Analytics.

2 Decision

NOKUT made the following decision on 21 April 2020:

NOKUT considers that the criteria in the regulations are fulfilled. We therefore accredit the master of science in information systems (120 ECTS) at Kristiania University College. The study programme is a master degree programme, after section 3 in the master degree regulation. The accreditation is valid from this date.

The original decision in Norwegian:

NOKUT vurderer at vilkårene i NOKUTs forskrift om tilsyn med utdanningskvaliteten i høyere utdanning av 9. februar 2017 og i forskrift om kvalitetssikring og kvalitetsutvikling i høyere utdanning og fagskoleutdanning av 1. februar 2010 nå er oppfylt.

Vi akkrediterer derfor utdanningen Master of Science in Information Systems (120 studiepoeng) med den nye spesialiseringen Business Analytics ved Høyskolen Kristiania AS. Studiet er en mastergrad etter mastergradsforskriften § 3. Akkrediteringen er gyldig fra vedtaksdato.

3 Expert assessment

The term «we» in this chapter, refers to the Expert Committee as such. The number preceding each heading refers to the corresponding provision in the Quality Assurance Regulation in Higher Education.

3.1 Summary

The applicant institution, Kristiania University College (Høyskolen Kristiania) has applied for accreditation of a new specialisation in *Business Data Analytics* under its existing programme *Master of Science in Information Systems*, complementing two already existing specialisations (*Management and Innovation* and *Digital Business Systems*). The Expert Committee has assessed the application against the criteria set forth in the Quality Assurance Regulation in Higher Education (Quality Assurance Regulations) and the Ministerial Regulations concerning quality assurance and quality development in higher education and tertiary vocational education (The Ministerial Regulations).

The application is well-drafted and answers most of the assessment criteria. However, the Committee has identified a number of weaknesses that the applicant institution must rectify before a positive decision can be made.

The first of these is related to the heterogenous Bachelor-level qualifications which the application foresees to allow admission to the programme. The institution has to take appropriate steps in the curriculum design that can ensure that all admitted applicants have, or are given the opportunity to develop, a sufficient level of competence in mathematics, informatics and statistics to study the new specialisation with a realistic chance of being able to master it.

However, the Committee feels that even after such an adjustment, the title *Business Data Analytics* might be somewhat misleading, giving future employers an exaggerated impression of the (in all likelihood rather limited) data science and data engineering skills of the programme's graduates. The Committee finds that clarity is still needed in terms of how the applicant view analytics, through which branch of information systems. Due to a lack of information, currently the Committee must ask the institution to choose a more appropriate title for the new specialisation (e.g., *Business Intelligence*).

Somewhat related to that, the Committee asks for a clarification to how graduates can enter into doctoral research. In the current version of the application, there is no clear indication how the field of research can be embodied, giving insufficient guidance to potential doctoral candidates. An operations research inspired degree would require significantly more applied mathematics subjects, whereas the Committee have assumed (due to a lack of information) that the applicant will aim for a data-driven management science approach.

The fourth weakness the Committee would like to stress there is a lack of clarity in the provisions made for international student exchange. The application appears to require participation in a mandatory course during the same semester in which students are supposed to consider international exchange. The Committee asks the institution to make appropriate arrangements to avoid such conflicts.

Further requirements and advice are outlined in detail below, structured according to the criteria in the Quality Assurance Regulation and the Ministerial Regulations.

<u>Assessment after the response from the institution to the initial report</u>
Kristiania University College has submitted comments to the initial report, and documented several changes to the study programme. In their response Kristiania University College have changed the title of the specialisation to Business Analytics. They have also documented several changes to the content of the programme and clarified the arrangements for student exchange. Based on this the committee has made a new evaluation of some of the points raised in the draft report. The Committee finds that all the requirements are satisfactorily met and recommends accreditation. The Committee advises the institution to evaluate the specialisation two years after the first cohort started to ensure that the admitted candidates match the required prerequisite qualifications in practice.

3.2 Basic prerequisites for accreditation (§ 3-1 (4) in Ministerial Regulations concerning quality assurance and quality development in higher education and tertiary vocational education and § 2-1 in Quality Assurance Regulation in Higher Education)

3.2.1 Demands expressed in the Universities and College Act

<u>From the Ministerial Regulations:</u>
§ 3-1 (4) It is a condition for accreditation being granted that the requirements of the Universities and University Colleges Act are met. Regulations adopted under the authority of Section 3-2 of the Universities and University Colleges Act shall form the basis for the accreditation.

<u>From the Quality Assurance Regulation:</u>
§ 2-1 (1) The requirements of the Act relating to Universities and University Colleges and its corresponding regulations must be met.

Assessment

Kristiania University College is an accredited university college. Requirements related to the institutions regulations, quality assurance system, learning environment and appeal board are not evaluated. The application is based on regulations concerning master's degree requirements § 3 (*mastergradsforskriften*). The programme awards 120 ECTS and the master thesis is 45 ECTS.

Admission requirements. The Master of Science in Information Systems offered by the institution accepts applicants with completed Bachelor degrees (passed with a degree of C or better on the ECTS scale) in information technology, management, economics, E-business or marketing. Admission to the programme does not require any specific prerequisite subjects. The admission requirements are not differentiated with respect to the two specialisations currently offered in the programme (*Management and Innovation* and *Digital Business Systems*) or the new specialisation evaluated here (*Business Data Analytics*).

The institution has stated that job opportunities for graduates of the new programme include data scientist and data engineer. The Expert Committee sees the admission policy as something of a challenge for the new specialisation *Business Data Analytics*. In the experience of the committee

members, two-year master programmes in analytics or data science tend to be too short to leave enough room for the "compensatory" courses that may be required to ensure that *all* newly enrolled students – given their heterogenous prior educations – have the necessary level of prerequisite competences to stand a realistic chance of mastering the data engineering, analytics, and data science subjects. These prerequisite competences include at least introductory university-level mathematics and informatics and, most importantly, at least intermediary university-level statistics.

One possibility to avoid problems of insufficient prerequisite competences is good guidance: since the institution plans to conduct pre-enrolment interviews with applicants whose prerequisite competences are somewhat doubtful, it could also utilise these interviews to guide the applicants towards a specialisation that progresses directly from their prior competences. In Section 3.3.2 (see below), we outline a second strategy that can complement the first: a repositioning of the new specialisation (under a different title) that would put less emphasis on the analytics aspects of the curriculum. In Section 3.3.4 (see below), we outline further possibilities how the curriculum of the new specialisation could be adapted in such a way that intermediary statistics and data science are offered as part of the programme.

The institution is required to:
- Reassess how any given applicant can achieve the posture of data scientist or data engineer, granted that this is a management programme that also do not define mathematical or engineering prerequisites. Provided this is still an aim of the institution, then take appropriate steps to ensure that admitted applicants have, or are given the opportunity to develop, a sufficient level of competence in mathematics, informatics, engineering, and statistics to study the new specialisation with a realistic chance of being able to master it.

<u>Assessment after the response from the institution to the initial report</u>
In the assessment of the original application, the Expert Committee required the applicant institution to "reassess how any given applicant can achieve the posture of data scientist or data engineer, granted that this is a management programme that also do not define mathematical or engineering prerequisites. Provided this is still an aim of the institution, then take appropriate steps to ensure that admitted applicants have, or are given the opportunity to develop, a sufficient level of competence in mathematics, informatics, engineering, and statistics to study the new specialisation with a realistic chance of being able to master it."

In the revised application, the institution has addressed the Committee's requirement in the following way:

- The specialisation as a whole is now clearly positioned as a Business Analytics specialisation. Claims to future employment possibilities as data scientists or data engineers have been eliminated from the programme description. The name of the specialisation has been changed in accordance and is now Business Analytics. As a consequence, mathematical and engineering prerequisites that would have been regarded as essential in a data science or data engineering specialisation are no longer of crucial importance.
- The applicant institution has changed the curriculum. A mandatory introduction course Data Mining and Applied Statistics has been added, trying to ensure that all newly enrolled candidates have the basic data management and intermediary statistics competences that are necessary to master the somewhat more advanced analytics courses in the specialisation.

- The institution has added a suggestion to the qualification requirements (but not actually a requirement) that candidates with "courses in mathematics, programming, statistics, and/or econometrics are highly preferred" (p. 2 of the programme description).

The Committee finds these adjustments satisfactory. Further standardisation of the qualification requirements might force the institution to target an overly narrow segment of in the market for applicants; for a private-sector institution, this would be highly problematic.

Other possible adaptations will very much depend on how well the admitted candidates match the required prerequisite qualifications in practice. In order to be able to evaluate this, the institution will need to acquire some experience. Hence, the Committee advises the institution to evaluate the specialisation two years after the first cohort started.

Conclusion

Yes, the demands expressed in the Universities and College Act are fully met.

The institution is advised to
- Evaluate the specialisation two years after the first cohort started and update the qualifications requirements and the curriculum in an appropriate manner, taking the experiences made in the first two years into account.

3.2.2 Information about the educational provision

§ 2-1 (2) Information provided about the programme must be correct and show the programme's content, structure and progression, as well as opportunities for student exchanges.

Assessment

The educational provision is correctly described. Content and structure of the *Master of Science in Information Systems* and the planned specialisation in *Business Data Analytics* are shown in sufficient detail. However, there are weaknesses in the application concerning progression and opportunities for student exchanges. Regarding progression, the Expert Committee is not convinced that the curriculum can sufficiently ensure that candidates with the diverse Bachelor qualifications that are recognised in the admission process, can really master the analytics subjects included in the programme (for details, see Section 3.2.1, above). Regarding opportunities for student exchanges, the application does not show in which semester the exchange is actually possible (for details, see Section 3.3.8, below).

The institution is required to:
- Clarify how the curriculum ensures successful progression from the diverse Bachelor qualifications recognised for admission to the study programme, to the learning goals of the new specialisation.
- Clarify when in the study programme students can participate in international student exchanges.

Assessment after the response from the institution to the initial report

In the assessment of the original application, the Expert Committee required the applicant institution to clarify "how the curriculum ensures successful progression from the diverse Bachelor qualifications recognised for admission to the study programme, to the learning goals of the new specialisation" and "when in the study programme students can participate in international student exchanges."

In the revised application, the institution has addressed the Committee's requirements in the following ways:

- As already assessed under Section 3.2.1, the applicant institution has changed the curriculum and added suggested specific qualifications it would prefer applicants to have (see above) in order to ensure successful progression from the candidates' Bachelor education.
- The applicant institution has made additional agreements with the host institutions it has student exchange agreements with, that candidates on exchange can indeed take courses that are equivalent (at the host institution). If for some reason the host institution does not provide an equivalent research method course, the applicant institution might deliver this course online as distance education courses in such a way that programme students can indeed participate in international student exchanges during the third study semester.

The Committee finds the changes made by the applicant institution satisfactory. As already indicated in section 3.2.1, we think that the institution should have the opportunity now to gather practical experience with the running of the programme. Further adjustments may be based on a systematic evaluation of, for example, the first two years after the initial student cohort began their studies.

Conclusion

Yes, the information about the educational provision is satisfactory.

The institution is advised to
- Evaluate the new programme specialisation two years after the first student cohort started (for details, see Section 3.2.1 above).

3.3 Demands to the educational provision (§ 2-2 in the Quality Assurance Regulation in Higher Education)

3.3.1 Learning outcome and title of educational provision

> § 2-2 (1) The learning outcomes for the programme must be in accordance with the National Qualifications Framework for Lifelong Learning, and the programme must have an appropriate title.

Assessment

Title
The application concerns a new specialisation, *Business Data Analytics*, which the institution wishes to offer under their existing Master of Science in Information Systems. Whilst the application defines the field of Information Systems, there is no clear definition of the field of research and professional practice represented by the new specialisation *Business Data Analytics* (p. 15 of the main application

document) and no clear delineation from field of research and professional practice represented by the existing specialisation *Digital Business Systems*. It is somewhat difficult for the committee to see a clear distinction between the two.

For the term "business analytics", definitions begin to emerge. An article in the inaugural issue of the still rather young Journal of Business Analytics defines the subject as "a systematic thinking process that applies qualitative, quantitative and statistical computational tools and methods to analyse data, gain insights, inform, and support decision-making in businesses. Any particular analysis may use a variety of techniques including diagnostic, predictive, prescriptive and optimisation models" (Power, D. J., Heavin, C., McDermott, J., & Daly, M. (2018). Defining business analytics: An empirical approach. *Journal of Business Analytics, 1* (1), 40-53). Note that this journal is an official publication of the Operational Research (OR) Society. However, OR is clearly *not* the orientation of the new specialisation evaluated here. Rather, the specialisation as presented seems more in line with Davenports (2006, HBR) original view in "Competing on Analytics", as a data-driven management science. The applicant should reflect further on the lineage of the specialisation and then explicate this information in the application.

Particularly problematic may be the bigram "data analytics" in the proposed title of the new specialisation; the committee feels that such a title might mislead employers into expecting that the programme graduates have substantially more advanced data engineering and/or machine learning skills than the programme can deliver, comparable to specialised data science programmes. Some students may enter the specialisation with prior mathematical or engineering competences, whereas such prerequisite competences are not mandatory for admission it may lead students to expect something that they will struggle to master. Although usage of terminology is changing, current parlance would consider the term "Business Intelligence" as more appropriate for the new specialisation. We urge the applicant institution to consider this or other alternatives that clearly show the management sciences heritage.

Learning outcomes
The learning outcome of the study programme is listed in the appendix. The formulation of the programme-level learning outcomes conforms to the requirements of the National Qualifications Framework for Lifelong Learning, Level 7 (master). The applicant institution has submitted specialisation-level learning outcomes (Appendices 1 and 2a) and provided a mapping of the course-level learning outcomes onto programme-level learning outcomes (Appendix 2b). However, the mapping in Appendix 2b is only done with respect to the learning outcomes specified for the *Master of Science in Information Systems* degree (mgmt. and innovation, Appendix 2a). The new specialisation in *Business Data Analytics* has introduced specialized competences (Appendix 2a) that should be addressed. This should be rectified: the institution should also provide a detailed mapping of the course-level learning outcomes onto the specialisation-level outcomes for the proposed new specialisation.

The institution is required to:
- Find a more appropriate title for the proposed new specialisation, for example, *Business Intelligence* or other more management science focused name.
- Provide clarity to what branch of information systems the specialisation relates to and the progression to doctoral studies.

- Provide a mapping of the course-level learning outcomes onto the specialisation-level outcomes for the proposed new specialisation.

In the assessment of the original application, the Expert Committee required the applicant institution to "find a more appropriate title for the proposed new specialisation, for example Business Intelligence or other more management science focused name", "provide clarity to what branch of information systems the specialisation relates to and the progression to doctoral studies" and "provide a mapping of the course-level learning outcomes onto the specialisation-level outcomes for the proposed new specialisation".

In the revised application, the institution has addressed the Committee's requirements in the following ways:

- As already assessed under Section 3.2.1, the applicant institution has repositioned the specialisation and changed its title to Business Analytics.
- The new positioning statement is formulated on the level of the Master's programme in Information Systems ("IS Masters work as CIOs, IT managers, business developers, software developers, business analysts, consultants and IT security staff", see p. 2 of the revised programme description), including the roles "business analyst" and "consultant" as relevant career options for the new specialisation's graduates.
- The new positioning also includes a changed statement regarding possible progression to PhD-level studies ("after completing the Master's programme, the candidate is also formally qualified for a PhD study in a related area of research", p. 2 of the revised programme description). The rather misleading claims in the original application that the specialisation would qualify for PhD studies in computer science have been eliminated in the revised programme description.
- A mapping of course-level learning outcomes onto the programme-level learning outcomes is included now (pp. 5-8 of the revised programme description).

The Committee regards the changes made by the applicant institution as satisfactory.

Conclusion

Yes, the descriptions of the programme's learning outcome and title are satisfactory.

3.3.2 The educational provision's academic update and professional relevance

§ 2-2 (2) The programme must be academically up-to-date and have clear academic relevance for further studies and/or employment.

Assessment

The proposed title of the specialisation is *Business Data Analytics[1]*. The curriculum consists of classical IS subjects and a module on business data and analytics. The proposal states that the aim is a professional degree, however the degree also contain 15 ECTS on IS and research methods that provides students with a bridge to research-based studies.

As stated in detail in Section 3.3.4 (see below), the Committee feels that students need to gain some additional technical understanding to prepare them for independent research and work. There should be an equal part of business data and analytics for students to gain both perspectives in-depth.

Furthermore, it is the experience of the Committee that the competence, which employers require of data analytics professionals are changing more rapidly than in other IS specialisations. Hence, the Committee would advise the applicant institution to introduce appropriate systems and procedures (e.g., annual course revision meetings) to ensure that course descriptions and learning outcome specifications are continuously reviewed and updated, taking feedback from participating faculty members, current students, alumni and employers into account.

The application states that the Master of Science in Information Systems will fully qualify graduates for doctoral programmes in information systems (p. 11 of the main application document). NTNU and UiO are specifically mentioned as the main PhD programmes in Norway for which the graduates would be attractive. The Committee notes that neither of these institutions actually has a specific PhD programme in information systems. NTNU has one potentially relevant PhD programme in Computer Science and another potentially relevant PhD programme in Industrial Economics and Technology Management. UiO has a PhD programme in Natural Sciences that also covers computer science. If these two institutions are specifically mentioned as "customers" for the graduates of the MSc in Information Systems which the applicant institution offers, the Committee would suggest that the institution explain in more detail to which degree its graduates fulfil the admissions requirements of the respective programmes and present examples of how their previous graduates fared who later obtained PhDs in these programmes or equivalent ones at other universities.

Conclusion

Yes, the educational provision's relevance for working life and/or continued studies is clearly expressed.

The institution is advised to:
- Follow the suggested changes in Section 3.3.4 (see below) to ensure that students have sufficient prerequisite qualifications in informatics, statistics and machine learning.
- Introduce appropriate systems and procedures that can ensure that course descriptions and learning outcome specifications are continuously reviewed and updated.

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[1] The name was changed to Business Analytics during the process.

- Clarify to which degree the graduates of the MSc in Information Systems fulfil the admission requirements of relevant PhD programmes at NTNU, UiO and all other universities specifically named in the application, and how the institution's previous graduates were in the respective PhD programmes.

3.3.3 The provision's workload

§ 2-2 (3) The total workload of the programme must be between 1,500 and 1,800 hours per year for full-time students.

Assessment

The study plan provides a recommended workload of 1600h per year. The workload outlined in the curriculum is divided between lectures, self-study, preparatory exercises, exercises and assessments. The committee feels that this division seems reasonable in relation to the learning outcomes for all subjects outlined in the curriculum. However, out of all the mandatory courses, it is only MS220 that lists any coursework requirements; yet there is ~78 hours dedicated to assessment and exercises for all courses. The institution should therefore introduce some required coursework in those courses where this is possible. If not, the committee finds it hard to see how the staff can ensure guidance and feedback to the students during the semester, and furthermore, what the mentioned 78 hours are meant to be spent on.

Conclusion

Yes, the total workload of the programme is between 1,500 and 1,800 hours per year for full-time students.

The institution is advised to:
- Introduce required coursework to all applicable courses where 'assessment' is listed as making up a part of the total workload.

3.3.4 The educational provision's content, structure and infrastructure

§ 2-2 (4) The programme's content, structure and infrastructure must be adapted to the programme's learning outcomes.

Assessment

Content and structure
The committee feels that a specialisation that is explicitly positioned as a data analytics specialisation should have a larger share of data analytics in the mandatory part of the curriculum than is currently the case. Furthermore, the current version of the curriculum contains two advanced analytics subjects (such as *MB210 Text Analytics* and *MB221 Advanced Visual Analytics*) that, in the experience of the committee members, can typically not be mastered by students without the equivalent of 20 to 30 ECTS intermediary courses in informatics, statistics and machine learning (advanced bachelor or early

master level). The admission requirements do not ensure that students come with these qualifications as prerequisites – only a "Bachelor's degree in related disciplines such as IT, management, economics, e-business, or marketing" (Appendix 1, p. 1) is required. Hence, the Committee finds that the 7.5 ECTS currently allocated to the subject area represented by the course *MB120 Applied and Big Data Analytics* should be extended to 15 ECTS. An introductory course to data wrangling (= classical feature engineering techniques) and machine learning (= regression, classification, regularisation techniques, hyperparameter tuning, model assessment and model selection) would be ideal, preferably based on functional or object-oriented programming frameworks. The course *MS220 Social Media Management* could, for example, be changed to the status of an elective.

Infrastructure
The proposed specialisation does not involve course subjects that would require access to specialised infrastructure beyond that which is usually required for IS programmes (in data science or data engineering programmes, this might for example include high-performance computing clusters or specialised laboratories for mechatronics applications). The Committee finds that the infrastructure currently provided by the applicant institutions is fully adequate for the proposed new specialisation.

The institution is required to:
- Expand the 7.5 ECTS currently allocated to the subject area of the course *MB120 Applied and Big Data Analytics* to 15 ECTS in such a way that more intermediary informatics, statistics and machine learning topics are covered.

Assessment after the response from the institution to the initial report
In the assessment of the original application, the Expert Committee required the applicant institution to "expand the 7.5 ECTS currently allocated to the subject area of the course MB120 Applied and Big Data Analytics to 15 ECTS in such a way that more intermediary informatics, statistics and machine learning topics are covered".

In the revised application, the institution has addressed the requirements in the following way:

- An additional mandatory course "Introduction to Data Mining and Applied Statistics" is included in the curriculum now.

The Committee regards the additional course as an appropriate means to ensure that all admitted students can progress towards the more advanced analytics topics covered in later courses offered in the specialisation.

Conclusion

Yes, the educational provision's content, structure and infrastructure are adapted to the learning outcome.

3.3.5 Teaching-, learning- and assessment methods

Assessment

The programme contains teaching, learning, and assessment methods for each course. Mandatory courses contain, in general, a mix of an individual essay and a group-based project assignment as forms of examination. This is well adapted to the nature of an information systems programme. Some courses also contain technical elements that are important for the student in taking an active role both during and after the studies.

As already noted in Section 3.3.2 (see above), it is the experience of the Committee that the competences which employers require from data analytics professionals are changing more rapidly than in other IS specialisations. Hence, the Committee would advise the applicant institution to introduce appropriate systems and procedures (e.g., annual course revision meetings) to ensure that course descriptions and learning outcome specifications are continuously reviewed and updated, taking feedback from participating faculty members, current students, alumni and employers into account. The feedback and revision meetings would ensure that students take an even more active role in the learning process.

Conclusion

Yes, the teaching-, learning- and assessment methods are suited for the assessment of the students' attainment of learning outcomes.

The institution is advised to:
- Introduce appropriate systems and procedures that can ensure that course descriptions and learning outcome specifications are continuously reviewed and updated.

3.3.6 Links to research and academic and/or artistic development work

Assessment

Based on the staff CV list provided by the applicant institution, we find it contains 16 academic members, of which 15 members have a PhD degree. Virtually all faculty and adjunct faculty involved in the MSc in Information Systems are active researchers in areas covered by the programme and regularly publish in peer-reviewed journals and conference proceedings. The research areas of the faculty members include digital marketing; business intelligence, visualisation and dashboard design; social media analytics; privacy, electronic ID solutions and E-governance; blockchains; digital collaboration platforms; incident and emergency management systems; front-end development,

usability and user experience; maturity models; information infrastructures and architecture; enterprise resource planning systems.

Also conversely, most areas in the proposed new specialisation *Business Data Analytics*[2] are covered by ongoing research activities of full-time and adjunct faculty members. Statistics and machine learning, however, are clearly underrepresented, given the analytics focus of the new specialisation (also see below, Section 3.4.5). The Committee advises the institution to extend the team responsible for the planning and delivery of the new specialisation with a faculty member (possibly from a neighbouring department) who is an active researcher in the area of statistics and machine learning.

In the 3rd semester, the course MS320 Research Methods will prepare students for their own research. In the master's thesis (45 ECTS) the students will conduct an R&D project of their own under guidance by the involved faculty.

Conclusion

Yes, the educational provision has satisfactory links to research and academic and/or artistic development work.

The institution is advised to:
- Extend the team responsible for the planning and delivery of the new specialisation with a faculty member who is an active researcher in the area of statistics and machine learning.

3.3.7 The educational provision's internationalisation arrangements

§ 2-2 (7) The programme must have internationalisation arrangements adapted to the programme's level, scope and other characteristics.

Assessment

The programme is taught entirely in English, contributing to an international environment surrounding the programme. A large part of the involved faculty and adjunct faculty are international or have international work experience. In addition, use of international cases and cooperation with international companies is foreseen. For example, the institution has engaged five adjunct professors from abroad with the program, and the application states that students will engage with several cases related to the global IT-industry. The institution's internationalisation arrangements is therefore deemed satisfactory by the Committee.

Conclusion

Yes, the provision has internationalisation arrangements adapted to its level, scope and other characteristics.

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[2] The name was changed to Business Analytics during the process.

3.3.8 The educational provision's systems for international student exchange

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§ 2-2 (8) Programmes that lead to a degree must have arrangements for international student exchanges. The content of the exchange programme must be academically relevant.

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Assessment

Based on the curriculum, it only seems possible to go on an international exchange in the 3rd semester. However, the structure of the 3rd study semester appears a little awkward and it is not clear how the students can fit an exchange semester into their study plan and still meet all the formal requirements for the degree. For example, if the host institution does not provide a course in research methods, the candidate will finish the MSc without any formal training in said field. This could be detrimental to students wishing to pursue further studies. Kristiania should therefore make it more explicit when and how students are expected/advised to complete a semester abroad.

The institution is required to:
- Define exact periods when the students intending to go on international exchange can indeed do so and still take the mandatory coursework at Kristiania in Oslo.
- Ensure, in contact with the host institutions, that mandatory courses to be taken in the semester reserved for international exchange can in a comparable form also be taken at the host institution.

Assessment after the response from the institution to the initial report

In the assessment of the original application, the Expert Committee required the applicant institution to "define exact periods when the students intending to go on international exchange can indeed do so and still take the mandatory coursework at Kristiania in Oslo" and "ensure, in contact with the host institutions, that mandatory courses to be taken in the semester reserved for international exchange can in a comparable form also be taken at the host institution."

In the revised application, the institution has addressed the Committee's requirements in the following way:

- The applicant institution has made additional agreements with the host institutions it has student exchange agreements with, that candidates on exchange can indeed take courses that are equivalent (at the host institution). If for some reason the host institution does not provide an equivalent research method course, the applicant institution might deliver this course online as distance education courses in such a way that programme students can indeed participate in international student exchanges during the third study semester.

As already assessed under Section 3.2.1, the Committee regards the changes made by the applicant institution as satisfactory.

Conclusion

The programme have arrangements for international student exchanges.

3.3.9 Supervised professional training

> § 2-2 (9) Programmes that include supervised professional training must have formal agreements between the institution and the host for the supervised professional training.

Assessment

Not applicable.

3.4 Academic environment (§ 3-2 in Ministerial Regulations concerning quality assurance and quality development in higher education and tertiary vocational education and § 2-3 in the Quality Assurance Regulation in Higher Education)

3.4.1 The educational provision's defined limitations and academic breadth

> § 3-2 (1) Master's degree programmes shall be defined, delimited and have sufficient academic breadth.

Assessment

As already discussed in Section 3.3.1 (see above), the application concerns a new specialisation, *Business Data Analytics*, which the applicant institution wishes to offer under their existing Master of Science in Information Systems. Whilst the application defines the field of Information Systems, there is no clear definition for the specialisation name *Business Data Analytics*. As stated, we urge the applicant institution to consider this or other alternatives that clearly show the management science heritage. The bigram "data analytics" may be problematic for specialisation; the committee feels that such a title might mislead employers into expecting that the programme graduates have substantially more advanced data engineering and/or machine learning skills than the programme can deliver.

The institution is required to:
- Find a more appropriate title for the proposed new specialisation that reflects the business scope of the specialisation.

Assessment after the response from the institution to the initial report
In the revised application, the institution has addressed the Committee's requirements in the following ways:

- As already assessed under Sections 3.2.1 and 3.3.1, the applicant institution has repositioned the specialisation and changed its title to Business Analytics.

The Committee considers the new title of the specialisation as appropriate and aligns with the content of the specialisation.

Conclusion

Yes, the proposed new specialisation in the Master of Science in Information Systems is well-defined and delimited.

3.4.2 The academic environment's composition, size and competence

From the Quality Assurance Regulation in Higher Education:
§ 2-3 (1) The academic environment for each programme must be of a size proportionate to the number of students and the programme's characteristics, be stable over time in terms of competence and have a composition that covers the programme's topics and subjects.

From the Ministerial Regulations:
§ 3-2 (2) Master's degree programmes shall have a broad, stable academic environment comprising a sufficient number of staff with high academic expertise in education, research or artistic research and academic development work within the field of study. The academic environment shall cover the subjects and courses that the study programme comprises. Staff members in the academic environment in question must have relevant expertise.

Assessment

The application lists 16 members of the immediate academic environment, which have allocated 6.31 full-time equivalents to the Master programme, whereof 2.95 full-time equivalents are dedicated to teaching and supervision. Their combined experience should be seen as providing a stable leadership for the programme. The committee considers the academic environment (faculty and adjunct faculty) to have the right composition, size and competence mix.

The applicant has specified that the curriculum for each course will be revised once a year (and assessed by an external examiner), in order to ensure that new research insights are included, and that the cases used are interesting and relevant for the studies. Lecturers will, when academically appropriate, include their own research in the courses. Given the broad experience of the academic environment, we can assume that students will receive proper supervision, also for those considering continuing to PhD studies within information systems. The applicant can still strengthen the faculty, see point 3.3.6 by extending the faculty with an active researcher in the area of statistics and machine learning.

Conclusion

Yes, the composition, size and collective competence of the academic environment is adapted to the programme.

3.4.3 The academic environment's educational competence

§ 2-3 (2) The academic environment must have relevant educational competence.

Assessment

Based on the staff CV list provided by the applicant, we find it contains 16 academic members, of which 15 members have a PhD degree. The list contains a broad spectrum of research areas the members are active within, which will provide students with specialised supervision competence. In addition, the applicant lists 19 other members available for student supervision and research activities. The committee considers the academic environment (faculty and adjunct faculty) as a whole to have the relevant education competence. Several faculty members have not yet fully completed their tertiary education curriculum but appear well on their way to do so.

Conclusion

Yes, the academic environment associated with the provision has relevant educational competence.

3.4.4 Academic management

§ 2-3 (3) The programme must have a clear academic leadership with defined responsibilities for quality assurance and the development of the study programme.

Assessment

There is a professor in charge of the master program and an associate professor in charge of the specialisation. The application does not contain any information concerning whether a board of studies or a functionally equivalent body is responsible for quality assurance. However, the applicant posits that an external examiner will be appointed to assess a faculty revision of the curriculum each year.

As already noted in Sections 3.3.2 and 3.3.5 (see above), it is the experience of the Committee that the competences which employers require from data analytics professionals are changing more rapidly than in other IS specialisations. Hence, the Committee would advise the applicant institution to formalise and explicate appropriate systems and procedures to ensure that course descriptions and learning outcome specifications are continuously reviewed and updated, taking feedback from participating faculty members, current students, alumni and employers into account.

Conclusion

Yes, the educational provision has an academic leadership with a defined responsibility for quality assurance and the development of the provision.

The institution is advised to:
- Formalise and explicate appropriate systems and procedures that can ensure that course descriptions and learning outcome specifications are continuously reviewed and updated.

3.4.5 Staff with primary employment

§ 2-3 (4) At least 50 per cent of the academic full-time equivalents affiliated to the programme must be staff with their primary employment at the institution. Of these, academic staff with at least associate professor qualifications must be represented among those who teach the core elements of the programme. In addition, the following requirements apply to the academic environment's level of competence:

  a) For first-cycle programmes, at least 20 per cent of the members of the academic environment must have at least associate professor qualifications.

  b) For second-cycle programmes, at least 50 per cent of the members of the academic environment must have at least associate professor qualifications. Within this 50 per cent, at least 10 per cent must have professor or docent qualifications.

  c) For third-cycle programmes, the academic environment must consist of academic staff with at least associate professor qualifications. At least 50 per cent must have professor or docent qualifications.

Assessment

The academic environment consists predominantly of permanent faculty members with at least associate professor qualifications within information systems or related fields. Almost 28 % of the full-time equivalents are professors. Few of the academic full-time equivalents (16 %) come from staff with temporary positions. Although most faculty members are involved in other programmes as well, the committee feels that the overall provision of faculty members is satisfactory. However, see section 3.3.6 that advise on the addition of faculty within some of the core elements of the analytics specialisation. Ensure that core subjects (business intelligence, machine learning, web analytics, data science) have sufficient academic expertise available for supervision of students during research projects.

Conclusion

Yes, the criteria and the demands specific to the cycle of the educational provision are fulfilled.

The institution is advised to:
  • Ensure that core subjects (business intelligence, machine learning, web analytics, data science) have sufficient academic expertise available for supervision of students.

3.4.6 The academic environment's research and/or artistic research and academic development work

Assessment

Virtually all faculty and adjunct faculty involved in the MSc in Information Systems are active researchers in areas covered by the programme and regularly publish in peer-reviewed journals and conference proceedings. As already discussed in Section 3.3.6 (see above), the research areas of the faculty members include digital marketing; business intelligence, visualisation and dashboard design; social media analytics; privacy, electronic ID solutions and E-governance; blockchains; digital collaboration platforms; incident and emergency management systems; front-end development, usability and user experience; maturity models; information infrastructures and architecture; enterprise resource planning systems.

Also conversely, most areas in the proposed new specialisation *Business Data Analytics*[3] are covered by ongoing research activities of full-time and adjunct faculty members. Statistics and machine learning, however, are clearly underrepresented, given the analytics focus of the new specialisation (also see above, Section 3.4.5). The Committee advises the institution to extend the team responsible for the planning and delivery of the new specialisation with a faculty member (possibly from a neighbouring department) who is an active researcher in the area of statistics and machine learning.

Conclusion

Yes, the criteria and the demands specific to the content and level of the educational provision are fulfilled.

The institution is advised to:
- Extend the team responsible for the planning and delivery of the new specialisation with a faculty member who is an active researcher in the area of statistics and machine learning.

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[3] The name was changed to Business Analytics during the process.

3.4.7 The academic environment's external participation

§ 2-3 (6) The academic environment for programmes that lead to a degree must actively participate in national and international partnerships and networks that are relevant for the programme.

Assessment

Faculty and adjunct faculty are involved in international cooperation in the Nordics and internationally. Faculty and adjunct faculty have an internationally diverse teaching and research profile, including internationally funded projects that may positively influence the proposed programme. The applicant provided summary of CVs for faculty shows that many of the permanent staff are active internationally. The lead for the business analytics specialisation shows significant recent international collaboration activity within both education and research. The leader for the IS program has shown consistent research collaboration activity over many years.

Conclusion

Yes, the academic environment actively participates in national and international collaborations and networks relevant for the programme.

3.4.8 Supervision of professional training

§ 2-3 (7) For programmes involving mandatory supervised professional training, the members of the academic environment must have relevant and updated knowledge from the field of the professional training. The institution must ensure that professional training supervisors have relevant competence and experience in the field of the professional training.

Assessment

Not applicable.

4 Conclusion

Based on the written application with attached documentation and the institutions commentary with attachments, the expert committee concludes the following:

The committee recommends accreditation of the Master in Information Systems with specialisation in Business Analytics at Kristiania University College.

5   Documentation

19/07338-1   HØYSKOLEN KRISTIANIA - ERNST G MORTENSENS STIFTELSE - søknad om akkreditering av master i Master of Science in Information Systems

19/07338-11   Vedr akkreditering av master i Master of Science in Information Systems ved HØYSKOLEN KRISTIANIA - ERNST G MORTENSENS STIFTELSE

19/07338-14   Tilsvar på utkast til rapport - akkreditering av Master og Science in Information Systems - Business Analytics

Appendix

Learning outcome of the programme

One the programme level, the learning outcomes of the *Master of Science in Information Systems* are specified as:

Knowledge
- K1. Candidates will have an advanced knowledge of information systems as a research field, in terms of theories, knowledge claims, research methods and professional standards.
- K2. They will be able to apply this knowledge, and to reflect on how information systems contribute to business, decision-making activities and societal aims.

Skills
- S1. Candidates will acquire practical skills in analysing complex IS problems, designing or recommending solutions, and in measuring and evaluating results.
- S2. Candidates will also have strong skills in applying research methods and techniques.

Competence
- C1. Candidates will take responsibility for solving complex tasks and conducting a research project at a high standard in an organisation.
- C2. This includes the ability to choose the appropriate research approach, to choose or develop a solution, to handle relationships ethically and professionally, and to evaluate and communicate the results in a systematic way.

On the specialisation level, the additional learning outcomes for the proposed new specialisation with the title *Business Analytics* are specified as:

Knowledge
- Describe and discuss key theories on how data analytics can enhance the data-product creation process and support value creation in organizations
- Students will gain both theoretical and practical experiences on how data analytics and visualisations can enhance the decision-making process and increase the competitive edge within organizations.

Skills
- Candidates are expected to enhance their statistical, decisional and analytical skills, through being equipped with hands-on skills in various courses to solve business problems, support data-driven decision-making, innovate, support digitalization, and monetization.

Competence
- The candidates shall be able to apply their state-of-the-art knowledge and skills in enhancing the overall decision-making process in organizations through their ability to analyse and visualize internal and external (big) data.
- They will also be able to carry out and manage business data analytics and data science projects, create and capitalize on data assets, evaluate results, and communicate findings ethically and professionally to subject experts and to the general public.

Presentation of the expert committee

Professor Joachim Scholderer, Norwegian University of Life Sciences (NMBU)
Joachim Scholderer is professor in Innovation Management at NMBU. He is responsible for the Business Analytics specialisations in the Master programmes in Data Science and Business Administration and for the specialisation in Digital Business Transformation in the Master programme in Entrepreneurship and Innovation. He has additional positions at the University of Zurich, Switzerland (Department of Informatics) and Aarhus University, Denmark (Department of Economics and Business Economics). He has published 78 peer-reviewed journal papers, 5 books, 30 book chapters and over 200 conference contributions. His h-index is 41.

Principal Lecturer Magnus Westerlund, Arcada, Finland
Magnus Westerlund (DSc), is the programme director of the master degree programme in big data analytics and deputy head of business and analytics department at Arcada University of Applied Sciences in Helsinki, Finland. He has a background from the private sector in telecom and information management and earned his doctoral degree in information systems at Åbo Akademi University. Magnus has research publications in the fields of analytics, IT-security, cyber regulation, and blockchain technology. His current research topics are found in the decentralized platform area of distributed applications, and the application of intelligent and secure autonomous systems.

Student Sondre Wold, University of Oslo
Wold finished his B.Sc in informatics at the Norwegian university of science and technology (NTNU) in the Spring 2019, and is now a student at the University of Oslo. He also works as a developer at Opoint Technology. He has previously worked at NTNU as a Research assistant at Excited SFU, where he mainly taught, but also contributed and co-authored a study about working life relevance in the computer science programmes at the Department of Computer Science, NTNU. The paper was published in connection to the MNT-conference in the Spring 2019. Wold was also a member of the student organisation for informatics.