Assessment report
Limited Framework Programme Assessment

Master Information Sciences

Radboud University

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 Master Information Sciences programme of Radboud University, which has been 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, as published on 20 December 2016 (Staatscourant nr. 69458).

The panel welcomes the objectives of the programme. The panel finds the concept of the *digital architect* to be a strong and valid concept, which could, however, be stated more pronounced. The intended learning outcomes match the programme objectives, are formulated clearly and conform to the master level. In addition, they meet the international requirements for this domain, as exemplified by the international IS2016 Curriculum of the Joint ACM/AIS MSIS 2016 Task Force. The intended learning outcomes may, however, address the function of information science as bridging the computer science and business domains more explicitly.

Although the comparison of the programme to other programmes is welcomed, the panel advises to address the positioning of the programme vis-à-vis other programmes in The Netherlands and abroad more elaborately.

The relations of the programme to the professional field are appropriate.

The organisation of the programme is solid. The panel is positive about the involvement of both the Faculty of Science and the Nijmegen School of Management in the programme, as in this way the interdisciplinary nature of the information science domain is adequately reflected.

Although the curriculum meets the intended learning outcomes, the panel suggests to draft the relations between the intended learning outcomes and the courses more comprehensively to align the curriculum and the intended learning outcomes better. The curriculum contents and coherence are adequate, the academic skills are covered appropriately and the curriculum is up-to-date. The panel advises, however, to address the *digital architect* concept more explicitly and to structure the Aligning Business and IT specialisation more strictly. New subjects such as knowledge representation are welcomed by the panel. The panel encourages programme management to increase the methodological part of the curriculum and to address design science methodology.

The lecturers in the programme are considered by the panel to be definitely experts in their fields and to be qualified researchers. The vast majority of them have PhD’s and a substantial number of them are Basic or Senior Teaching Qualification-certified. The panel noted the students to be positive about the lecturers. The panel suggests the lecturers to meet more frequently to discuss the alignment of courses. The panel also proposes to request the guest lecturers to attain teaching qualifications.

The admission requirements of the programme are adequate. The admission procedures are strict, which is considered by the panel to be favourable. The pre-master programme is appreciated. The panel suggests to provide more clear and complete information to prospective students, as this seems to be lacking somewhat. In addition, the panel advises to standardise the admission procedures for foreign students. The panel proposes to elaborate the policy to grant exemptions, as these procedures are not entirely clear at present.

The panel is of the opinion programme management could analyse and monitor the student success rates more intensely and should try to improve these figures.

The educational concept and study methods are very appropriate for this programme. The GiPHouse study method is regarded by the panel to be a good example of the educational setup of the programme.

The examination and assessment policies of the programme are appropriate and the position and responsibilities of the Examination Board meet the formal regulations.

The panel much appreciates the variety of examination methods, meeting the course contents. The panel noted not all of the examinations were fully in accordance with the guidelines regarding the listing of the points per question and also noted students being allowed to answer questions in Dutch. The panel proposes to be more strict on both issues.

The panel welcomes programme policy to have the two master thesis examiners coming from computer science and business backgrounds. The panel encourages programme management to try and achieve this for all master theses. In the thesis assessment form, the scientific research question ought to be a separate assessment criterion. The panel suggests to have the thesis assessment forms filled out more rigorously, allowing more elaborate substantiation of the grades given.

The panel finds the work of the Examination Board to be valuable, but recommends to have the Board review examinations more frequently and more elaborately.

Having studied the examinations of a number of courses of the programme, the panel assessed all of these examinations to be up to standard. The panel recommends, however, to consider raising the level of complexity of some of the examinations and making these more challenging.

None of the theses reviewed were assessed by the panel to be unsatisfactory. The grades of the theses were generally found to be consistent with the grades the panel would have given. In some specific cases, the panel assessed grades to be either slightly too high or slightly too low. In the case of some theses, the subjects addressed seemed to deviate somewhat from the objectives of the programme. The panel advises programme management to be more strict in the selection of thesis' topics.

In the panel's opinion, the programme succeeds in preparing the programme's graduates appropriately for suitable positions in the relevant professional field.

The panel which conducted the assessment of the Master Information Sciences programme of Radboud University 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, 11 April 2018

Prof. dr. ir. M.F.W.H.A. Janssen
(panel chair)

drs. W. Vercouteren
(panel secretary)

2. Assessment process

The evaluation agency Certiked VBI received the request by Radboud University to manage the limited framework programme assessment process for the Master Information Sciences programme of this University. This objective of the programme assessment process was to assess whether the programme would conform 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 Information Sciences convened to discuss the composition of the assessment panel and to draft the list of candidates.

Having conferred with management of the Radboud University programme, 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. M.F.W.H.A. Janssen, full professor ICT and Governance, head of Information and Communication Technology research group, Faculty Technology, Policy and Management, Delft University of Technology (panel chair);
- Prof. dr. G. Poels, full professor Management Information Systems, director Business Informatics research unit, Department of Business Informatics and Operations Management, Ghent University (panel member);
- Prof. dr. R. Leenes, full professor in Regulation by Technology, director Tilburg Institute for Law, Technology and Society, Tilburg University (panel member);
- E.E.M. Leo BSc, student Master Educational Sciences, University of Amsterdam, (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 outline of the self-assessment report, the subjects to be addressed in this report and the site visit schedule. In addition, the planning of the activities in preparation of the site visit were discussed. In the course of the process preparing for the site visit, programme management and the Certiked process coordinator regularly had contact to fine-tune the process. The activities prior to the site visit have been performed as planned. Programme management approved of 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 15 final projects. The grade distribution in the selection was ensured to conform to the grade distribution in the list, sent by programme management. Additional criteria have been taken into account, if these had been found to be relevant for the programme.

The panel chair and the panel members were sent 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 final projects of the programme graduates, these final projects being part of the selection made by the process coordinator.

A number of weeks before the site visit date, the assessment panel chair and the process coordinator met to discuss the self-assessment report 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 informed about the competencies, listed in the profile. Documents pertaining to a number of these competencies were presented to the panel chair. The meeting between the panel chair and the process coordinator served as the briefing for panel chairs, as meant in the NVAO profile of panel chairs.

Prior to the date of the site visit, 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 complete panel met to go over the preliminary findings concerning the quality of the programme. During this preliminary meeting, the preliminary findings of the panel members, including those about the final projects 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 2 November 2017, the panel conducted a site visit on the Radboud University campus. The site visit schedule was in accordance with the schedule as planned. In a number of separate sessions, panel members were given the opportunity to meet with Faculty Board representatives, programme management, Examination Board representatives, lecturers and final projects examiners, and students and alumni.

In a closed session at 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:	M Information Sciences
Orientation, level programme:	Academic Master
Grade:	MSc
Number of credits:	60 EC
Specialisations:	Security and Privacy
	Aligning Business and IT
Location:	Nijmegen
Mode of study:	Full-time
Registration in CROHO:	60255
Name of institution:	Radboud University
Status of institution:	Government-funded University
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 main objectives of the Master Information Sciences programme, as specified by management of the programme, are to educate students to become *digital architects*, being experts who know how to analyse information flows and business processes and know how to adopt information technology methods and techniques to design, evaluate and optimise these information flows and business processes. To that effect, the programme aims at familiarising students with both technical, information technology-related subjects and organisational, business-oriented subjects and at enabling students to bridge these domains. The programme may be considered to be an academic master programme, meant to educate students to solve complex, multidisciplinary problems in this field.

In the programme, the Educational Institute for Computing and Information Sciences, part of the Faculty of Science of Radboud University and the Institute of Management Research, a research institute of the Nijmegen School of Management work together to train students in both the information technology-related subjects and business-oriented subjects.

Students are offered two specialisations, being the Security and Privacy and the Aligning Business and IT specialisations. Students selecting the first specialisation, are trained to be able to define and implement information security and privacy strategies and policies in organisations. Students opting for the latter specialisation, are educated to design information architectures and business solutions addressing both organisational and technical dimensions.

Programme management translated the objectives into a series of intended learning outcomes. The intended learning outcomes are sub-divided into information science knowledge and skills, such as designing and implementing information systems solutions, academic skills, such as communications, negotiation and analytical skills and domain-specific fundamentals, such as general models of domains and the programme specialisations.

Programme management presented a table to show the intended learning outcomes to correspond to the Dublin descriptors for master level programmes.

The programme is said to conform to the international IS2016 Curriculum of the Joint ACM/AIS MSIS 2016 Task Force. The knowledge and the skills offered in the programme meet the IS2016 Curriculum requirements. Compared to similar programmes in The Netherlands, the programme may be said to distinguish itself by emphasising security, formal reasoning in the business context and the model-based system development approach.

In the programme, relations with the professional field are maintained. A number of lecturers have part-time appointments in industry. Guest lecturers from industry are regularly invited to lecture in the programme. In addition, the Professional Field Committee for the programme is in place, with members representing industry. This committee meets yearly to discuss the programme's alignment with current trends in the professional field.

Considerations
The panel welcomes the objectives of the programme. The panel finds the concept of the *digital architect* to be a strong and valid concept, which could, however, be stated more pronounced. This concept may be used to strengthen the identity of the programme.

The intended learning outcomes meet the programme objectives and are formulated clearly. In the panel's opinion, the intended learning outcomes may address the function of information science as bridging the computer science and business domains more explicitly. They should more clearly identify the knowledge and skills needed to bridge these domains.

The intended learning outcomes of the programme correspond to the international IS2016 Curriculum of the Joint ACM/AIS MSIS 2016 Task Force adequately and therefore match the international requirements for this domain.

The intended learning outcomes also conform to the master level.

Although the comparison of the programme to other programmes is welcomed, the panel proposes to address the positioning of the programme vis-à-vis other programmes in The Netherlands and abroad more elaborately.

The relations of the programme to the professional field are appropriate.

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 Master Information Sciences programme is a programme of the Educational Institute for Computing and Information Sciences, which is part of the Faculty of Science of Radboud University. Although being hosted at this Faculty of Science, the programme is the joint programme of the Faculty of Science and the Nijmegen School of Management. The programme is closely linked to the activities of both the Institute for Computing and Information Sciences, a research institute of the Faculty of Science and the Institute of Management Research, a research institute of the Nijmegen School of Management. The director of the Educational Institute for Computing and Information Sciences is responsible for the programme quality. The education coordinator of this institute monitors, among others, programme scheduling and student study results. The programme coordinator supervises programme delivery on a day-to-day basis. For the programme, the Programme Committee monitors the results of surveys among students. The Examination Board has the authority to monitor the examinations' quality and the examination processes.

The number of students entering the programme was rather stable over the past years, being on average about 22 students (based on figures for the 2012 to 2016 cohorts). About 20 % of the students enrolling come from abroad. Programme management considers the numbers of incoming students satisfactory and would like to keep the numbers at the current level. As no Bachelor programme in this field is offered anymore, the student influx may be endangered. About 50 % of the incoming students tend to choose the Security and Privacy specialisation and another 50 % of the students opt for the Aligning Business and IT specialisation.

Programme management presented a table to demonstrate the curriculum meeting the intended learning outcomes of the programme.

The curriculum of the programme is composed of mandatory courses (15 EC), Security and Privacy or Aligning Business and IT specialisation courses (18 EC), free electives (6 EC) and the Master Thesis project (21 EC). Most of the courses of the curriculum are designed for other programmes. The *System Approaches* course is specifically designed for this programme. The course *Knowledge Representation* is designed for this programme as well and will be introduced in the curriculum in 2017/2018. The mandatory course *Research Methods* is devoted to the study of research methods and techniques. The methodology addressed in this course is the qualitative research methodology. In the theses, students are required to turn problem statements or case studies into scientific hypotheses, researching the hypothesis by means of qualitative research methods. Design science methodology is addressed in other courses than the Research Methods course. Students are offered opportunities to spend part of the curriculum abroad, as an international internship to conduct their master thesis project or in the annual international Summer camp for talented students.

The lecturers in the programme are researchers of the Institute for Computing and Information Sciences or the Institute of Management Research. Researchers of the first institute are specialised in the domains of data science, software science and digital security. Researchers of the latter institute are specialists in the domain of business administration. Some of the lecturers are part-time guest lecturers, having been recruited for their experience in this field. A total of nineteen lecturers are involved in the programme. The lecturers of the Nijmegen School of Management all are Basic or Senior Teaching Qualification-certified. Of the ten lecturers of the Educational Institute for Computing and Information Sciences, four are qualified, two are in the process of acquiring the certificate and four are guest lecturers and, therefore, not required to be certified. The programme coordinator meets with every one of the lecturers to discuss overlap of and gaps between the courses.

The admission requirements for incoming students are having completed either the Bachelor Business Administration, including the Minor Computing Science for Business Administration or the Bachelor Computing Science, including the Minor Business Administration for Computing Science. Students having completed relevant HBO programmes, are only admitted, if they have completed the 33 EC pre-master programme. In all other cases, the Examination Board decides on admission. In the programme, a strict selection procedure is applied. Only 25 % of the applicants are admitted.

The student success rates for the programme have been calculated in terms of the average lead time of students in the programme. The average time of students to complete the programme was 19.4 months for the last five cohorts. Students having taken the pre-master programme tend to need more time than other students (25.4 months on average). Programme management sees causes for delay, among others, in the extended time for students to finish the master thesis. The student-to-staff ratio in the programme is about 27 : 1, including PhD students' and postdocs' teaching hours. The number of face-to-face education is 20 hours per week in the first semester and about 9 hours per week in the second semester, not counting the 15 hours of master thesis supervision. The educational concept adopted in the programme, is the so-called constructivist approach to learning processes, focussing on the construction of professional products, such as case studies, software, demos and reports. Study methods include plenary lectures, introducing subjects, guest lectures by lecturers experienced in the field, interactive tutorials and projects, requiring students to work individually or in small groups on assignments, without direct supervision from lecturers. In two of the courses, the so-called GiPHouse study method is adopted, which requires students to do assignments for real-world clients. Students work in line with the Agile working method.

Considerations
The panel regards the organisation of the programme to be solid and is positive about the involvement of both the Faculty of Science and the Nijmegen School of Management in the programme, as in this way the interdisciplinary nature of the information science domain is adequately reflected.

Although the panel regards the curriculum to meet the intended learning outcomes, the panel suggests to draft the relations between the intended learning outcomes and the courses more comprehensively to align the curriculum and the intended learning outcomes better. The contents and coherence of the curriculum are adequate. The academic skills are covered appropriately. The curriculum is also considered by the panel to be up-to-date. The panel advises, however, to address the *digital architect* concept more explicitly in the curriculum and to structure the Aligning Business and IT specialisation more strictly. New subjects such as knowledge representation are welcomed by the panel. The panel encourages programme management to address methodological approaches to a larger extent in the curriculum and to address design science methodology.

The lecturers in the programme are definitely experts in their fields and qualified researchers, while the vast majority of them have PhD's and a substantial number of them are Basic or Senior Teaching Qualification-certified. The panel noted the students to be positive about the lecturers. The panel suggests the lecturers to meet more frequently to discuss the alignment of courses. The panel proposes to request the guest lecturers to attain teaching qualifications.

The panel considers the admission requirements of the programme to be adequate and appreciates the pre-master programme. The panel has noted the admission procedures to be strict, which is to be considered favourable. The panel recommends to provide more clear and complete information to prospective students, as this seems to be lacking somewhat. In addition, the panel advises to standardise the admission procedures for foreign students. The panel proposes to elaborate the policy to grant exemptions, as these procedures are not entirely clear at present.

The panel is of the opinion programme management could analyse and monitor the student success rates more intensely and should try to improve these figures.

The educational concept and study methods in the programme are very appropriate for this programme. The GiPHouse study method is regarded by the panel to be a good example of the educational setup of the programme.

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 examination and assessment rules and regulations of the programme are determined by the Faculty of Science examination guidelines. The Examination Board of the Educational Institute for Computing and Information Sciences has the authority for the examinations and assessments of this programme and the other programmes of this institute.

Examination methods in the courses include, among others, written examinations, assignments, papers, projects and presentations.

For each of the courses, course dossiers have been compiled, which include learning goals, examinations, test matrices, answering of scoring models and student evaluations. Course examinations are reviewed by another examiner. Test matrices and answering of scoring models are required.

The students are entitled to the supervision by the thesis supervisor during the master thesis process. The master theses are assessed by the thesis supervisor and the second reader. For their assessment, they use the master thesis standardised scoring form which includes a number of assessment criteria. An oral presentation of the thesis is required. The policy adopted for the programme is to have the two examiners coming from both the Institute for Computing and Information Sciences and from the Institute of Management Research, to allow for the assessment of the interdisciplinary nature of the theses. Due to practical problems, programme management does not always succeed in involving two examiners coming from these distinct research backgrounds. Both examiners grade the written product and the presentation independently and together arrive at the overall grade.

The Examination Board appoints the examiners. The examination dossiers of each of the courses are reviewed every four years to inspect the examinations' quality and to verify whether the course learning goals are met. The Board also on a regular basis reviews master theses. As has been indicated, the Board is involved in the admission procedures.

Considerations
The panel considers the examination and assessment policies of the programme to be adequate. The position and responsibilities of the Examination Board meet the formal regulations.

The panel much appreciates the variety of examination methods in the courses, meeting the course contents. The panel noted not all of the examinations being fully in accordance with the guidelines of the Examination Board regarding the listing of the points per question and students being allowed to answer questions in Dutch. The panel recommends to be more strict on both issues.

The panel welcomes programme policy to have the two master thesis examiners coming from computer science and management science backgrounds. The panel encourages programme management to try and achieve this for all master theses. In the thesis assessment form, the scientific research question ought to be a separate assessment criterion. The panel suggests to have the thesis assessment forms filled out more rigorously, allowing more elaborate substantiation of the grades given.

The panel finds the work of the Examination Board to be valuable, but recommends to have the Board review examinations more frequently and more elaborately.

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.

As has been noted above, the panel reviewed a total number of fifteen final projects or theses of graduates of the programme, the theses exhibiting a variety of grades, ranging from satisfactory to very good. Many students combine their master thesis with internships at a wide range of organisations in The Netherlands. As has been indicated, students may take internships abroad as well.

Graduates of the programme tend to have good opportunities on the labour market and tend to find suitable positions rather easily. Graduates of the programme indicate feeling well-prepared for their current positions.

Considerations
Having studied the examinations of a number of courses of the programme, the panel assessed all of these examinations to be up to standard. The panel recommends, however, to consider raising the level of complexity of some of the examinations and making these more challenging.

None of the theses reviewed were assessed by the panel to be unsatisfactory. The grades of the theses were generally found to be consistent with the grades the panel would have given. In some specific cases, the panel assessed grades to be either somewhat too high or slightly too low. The differences with the grades the panel would have given, remained, however, relatively small. In the case of some theses, the subjects addressed seemed to deviate somewhat from the objectives of the programme. The panel advises programme management to be more strict in the selection of thesis' topics.

In the panel's opinion, the programme succeeds in preparing the programme's graduates appropriately for suitable positions in the relevant professional field.

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: Assessment	Satisfactory
Standard 4: Achieved learning outcomes	Satisfactory
Programme	Satisfactory

6. Recommendations

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

- To formulate the concept of the *digital architect* more pronounced in the programme objectives.
- To identify the function of information science as bridging the information technology and the business domains more explicitly in the intended learning outcomes.
- To address the positioning of the programme vis-à-vis other programmes in The Netherlands and abroad more elaborately.
- To provide more clear and complete information to prospective students.
- To standardise the admission procedures for foreign students.
- To draft the relations between the intended learning outcomes and courses more comprehensively.
- To address the *digital architect* concept more explicitly in the curriculum
- To structure the Aligning Business and IT specialisation more strictly.
- To increase the methodological part of the curriculum and to address design science methodology.
- For the lecturers to meet more frequently to discuss the alignment of courses.
- To request the guest lecturers to attain teaching qualifications.
- To elaborate the policy to grant exemptions, as these procedures are not entirely clear at present.
- To analyse and monitor student success rates more intensely and to try and improve these figures.
- To have all of the examinations conforming to formal requirements.
- To prevent students being allowed to answer questions in Dutch.
- To have all the master theses assessed by both an examiner with expertise in information technology and an examiner with a management science background.
- To make the scientific research question a separate criterion in the thesis assessment form.
- To have the thesis assessment forms filled out more rigorously.
- To have the Examination Board to review examinations more frequently and more elaborately.
- To consider raising the level of complexity in some of the examinations of the courses and making these more challenging.
- To be more strict in the selection of thesis' subjects, in order to keep these subjects aligned with the programme objectives.