wo-master
Business Intelligence and Smart Services
Maastricht University

March 24th, 2017

NVAO limited initial accreditation

Panel report

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1 Executive summary

The Accreditation Organisation of the Netherlands and Flanders (NVAO) received a request for an initial accreditation procedure, including programme documents, regarding a proposed wo-master Business Intelligence and Smart Services at Maastricht University. NVAO convened an expert panel, which studied the information available and discussed the proposed programme with representatives of the institution and the programme during a site visit.

The following considerations have played an important role in the panel's assessment.

The master's programme Business Intelligence and Smart Services (MSc BISS) is a one-year (60 EC) interdisciplinary programme aimed at training a new type of knowledge worker, who is able to analyse big data, make business decisions in data-rich environments and design data-driven smart services. The programme objectives combine different fields of expertise within Maastricht University's (UM) School of Business and Economics (SBE): information management, quantitative economics, and service design.

The panel considers the MSc BISS to be well-developed, relevant and distinctive from related programmes due to the central position of Service Design. The programme has a practical focus, with a direct connection to the industry, while maintaining an academic master's level that is clearly visible in the programme objectives and related assessment methods. The panel is pleased that the topics 'ethics' and 'privacy' are explicitly mentioned in the learning outcomes, and encourages the programme to additionally include legal aspects. Considering that these topics are part of multiple courses, the panel asks special attention for their assessment. The panel applauds the formation of an Advisory Board with external members, and considers this to be a good way to promote the programme, as well as essential to provide the students access to real world data and to match the needs of the corporate world with the learning outcomes of the programme on a regular basis.

According to the panel, the curriculum offers an adequate mix of broad and specialist knowledge, with three specialisations to choose from: Service Design, Business Intelligence Systems, and Business Analytics. Throughout the programme, students from the three specialisations cooperate. Students work on the intended learning outcomes in courses, projects and workshops that incorporate UM's didactic concepts of 'international classroom' and 'problem-based learning'. The innovative teaching modes are considered to be fitting and the panel appreciates that they build on UM's previous experiences from related programmes.

In two semester-long Smart Service Innovation Projects (SSIP) that run parallel to courses, students are grouped in multidisciplinary teams and work on semi-structured real-life cases (research projects) that are prepared in collaboration with companies. The teams are supported by company representatives and a team coach, while a UM project supervisor monitors the team's progress. The panel considers these projects to be a real asset to the programme and establishes that all those involved are aware of the possible bottlenecks surrounding the availability of real data and projects. The programme takes measures to limit related risks as much as possible. In this light the panel recommends that the programme also takes sufficient measures to avoid potential study delays due to availability of data processing resources and continues to invest in relation management with industrial partners, since they play a vital role in the success of the projects.

Most of the MSc BISS curriculum is followed at SBE's urban campus in Maastricht. In addition, SBE's Service Science Factory offers facilities designed for service innovation projects and students may use the facilities of the BISS Institute in Heerlen to work on the SSIPs. They are expected to meet in Heerlen at least four times per SSIP for 'milestone meetings' (e.g. kick-off and presentations). All stakeholders whom the panel met with, including the students, were very enthusiastic about the vibrant atmosphere at the BISS Institute and the panel is of the opinion that the programme clearly benefits from the long-term contacts with industrial partners via this institute.

The programme is very much aware of the challenges related to dealing with the envisaged diverse student population and the panel considers the amount of guidance and feedback students receive a strength. The panel expects that the programme will be able to adequately address the needs of individual students and, whenever necessary, to additionally support them in the development of their knowledge and skills. It encountered sufficient guarantees to ensure that students are able to obtain their degree and appreciates the personal Study Coaching Trajectory that supports students in their personal development.

The panel is contended to have met with qualified and highly motivated staff and it is satisfied with the opportunities for professional and didactical development already in place for the staff – in particular the advanced training on coaching. The teaching staff is aware of the considerable time investment required. Still, the panel strongly recommends to carefully monitor the staff's workload and to generate additional resources if necessary.

The panel appreciates the programme's appropriate assessment system with various assessment methods that are in line with the programme objectives and curriculum. Students are always assessed by UM examiners; industrial supervisors only have an advisory role, when appropriate, and the panel deems this fitting. During the programme, attention is paid to critical self-reflection and to dealing with feedback. Assessment is supported by SBE's assessment policies and structures. The Board of Examiners and Assessment Committee are considered to be well-prepared for their tasks and able to safeguard the quality of examinations. Additionally, the quality of MSc education within SBE is continuously monitored by the Programme Committee.

The panel comes to the conclusion that the programme meets all assessment standards. Given these considerations, the panel advises NVAO to take a positive decision regarding the quality of the proposed programme wo-master Business Intelligence and Smart Services at Maastricht University.

The Hague, March 24th, 2017

On behalf of the Initial Accreditation panel convened for the initial limited accreditation assessment of the wo-master Business Intelligence and Smart Services at Maastricht University,

Prof. W. Van Petegem	A. Martens
(chair)	(secretary)

2 Introduction

2.1 Procedure

NVAO received a request for an initial accreditation procedure including programme documents regarding a proposed wo-master Business Intelligence and Smart Services. The request was received on September 14th, 2016 from Maastricht University.

An initial accreditation procedure is required when a recognised institution wants to offer a programme and award a recognised bachelor's or master's degree. The procedure for initial accreditation is slightly different as compared to the approach for programmes that have already been accredited. Initial accreditation is in fact an ex ante assessment of a programme, and a programme becomes subject to the normal accreditation procedures once initial accreditation has been granted.

NVAO convened a panel of experts (see also Annex 1: Composition of the panel). The panel consisted of:
Chair:
– Prof. W. (Wim) Van Petegem, Policy coordinator Learning Technologies and Expert Multicampus & Engineering Education at the Faculty of Engineering Technology, KU Leuven.
Panel members:
– Prof. S. (Sander) Klous, Professor in Big Data Ecosystems for Business and Society at the University of Amsterdam, and partner in charge of Data & Analytics at KPMG Advisory in the Netherlands;
– A. (Arjan) van Dijk MMC RI, managing director Solution Management, Cegeka-DSA & Ambassador of the KNVI
Student member:
– L. (Lennart) van Doremalen BSc, student Research Master Experimental Physics, Utrecht University.

On behalf of the NVAO, Liza Kozlowska and Anne Martens, NVAO policy advisors, were responsible for the process coordination and the drafting of the experts' report.

The panel has based its assessment on the standards and criteria described in the NVAO Initial Accreditation Framework (Stcrt. 2014, nr 36791).

The following procedure was undertaken. The panel members prepared the assessment by studying the documents provided by the institution (Annex 3: Documents reviewed). Their first impressions were sent to the secretary of NVAO, in order to outline these remarks within the accreditation framework and detect the topics to be clarified during the site visit. The panel organised a preparatory meeting on March 7th, 2017, i.e. the day before the site visit. During this meeting, the panel members shared their first impressions and formulated questions for the site visit.

The site visit took place on March 8th, 2017 at Maastricht University. During this visit, the panel was able to discuss the formulated questions and to gather additional information during several sessions (Annex 2: Schedule of the site visit). Afterwards the panel discussed the findings and considerations and pronounced its preliminary assessments per theme and standard. These are based on the findings of the site visit, and built on the

assessment of the programme documents. At the end of the site visit, the initial findings were presented to the institution. Based on the findings, considerations and conclusions the secretary wrote a draft advisory report that was firstly presented to the panel members. After the panel members had commented on the draft report, the chair endorsed the report. On March 22nd, 2017 the advisory report was sent to the institution, which was given the opportunity to respond to any factual inaccuracies in the report. The institution replied on March 24th, 2017. All suggested corrections were adopted. Subsequently the final report was endorsed by the panel chair. The panel composed its advice fully independently and offered it to NVAO on March 24th, 2017.

2.2 Panel report

The first chapter of this report is the executive summary of the report, while the current chapter is the introduction.

The third chapter gives a description of the programme including its position within Maastricht University and within the higher education system of the Netherlands.

The panel presents its assessments in the fourth chapter. The programme is assessed by considering the themes and standards in the Initial Accreditation Framework. For each standard the panel presents an outline of its findings, considerations and a conclusion.

The outline of the findings are the objective facts as found by the panel in the programme documents, in the additional documents and during the site visit. The panel's considerations consist of the panel's judgments and subjective evaluations regarding these findings and their relative importance. The considerations presented by the panel are at the basis of a concluding overall assessment.

The panel concludes the report with a table containing an overview of its assessments per standard.

3 Description of the programme

3.1 Overview

Country	:	The Netherlands
Institution	:	Maastricht University
Programme	:	wo-master Business Intelligence and Smart Services
Specialisations	:	Service Design, Business Intelligence Systems, Business Analytics
Degree	:	Master of Science
Location	:	Maastricht
Study Load (EC)	:	60 EC
Field of Study	:	economics

3.2 Profile of the institution

Maastricht University (UM) was founded in 1976 and stands out for its innovative approach to learning by means of application of the Problem Based Learning model. The university has an international focus, with almost half of the 16,000 students and a third of the 2,000 academic staff coming from abroad. UM offers almost twenty bachelor's programmes and over fifty master's programmes that are mostly taught in English. The content of both education and research at UM is deeply rooted in European and broader international themes.

The university is organised in six faculties and schools, related to Arts and Social Sciences, Health, Medicine and Life Sciences, Humanities and Sciences, Psychology and Neuroscience, Law, and Business and Economics. Research and education at UM have a thematic, multidisciplinary nature, inspired by topical issues such as sustainability, European integration, healthy ageing and the influence of technological developments on society. Researchers work in multidisciplinary teams, in close collaboration with national and international institutions, companies and industry.

3.3 Profile of the programme

The one-year (60 EC) master's programme in Business Intelligence and Smart Services (MSc BISS) of Maastricht University's School of Business and Economics (SBE) aims to train a new type of knowledge worker, who is able to analyse big data, make business decisions in data-rich environments and design data-driven smart services. Graduates are capable of integrating technical insight and skills with commercial considerations in an entrepreneurial and socially sensitive manner, thus creating solutions for novel issues in the area of services in a rapidly evolving market. The programme bundles and continuously interconnects three specialisations: Service Design, Business Intelligence Systems, and Business Analytics. The aim of these specialisations is to link new technologies (i.e. Business Intelligence Systems) in obtaining and analysing data (i.e. Business Analytics) to develop smart services (i.e. Service Design). On a national level, the programme is complementary to existing programmes, and unique in terms of the combination of the three specialisations and its interdisciplinary focus on how new sources of data and novel techniques can improve managerial decision making and support the development of smart services.

The programme is aligned with Maastricht University's overarching research priority areas, namely 'Quality of Life' and 'Learning and Innovation'. SBE has gained extensive experience in the development of innovative services at the Service Science Factory, where students and teaching staff collaborate intensively in short-term innovation projects to solve problems and answer questions originating in the business sector and other external organisations. The MSc BISS is also linked to the development of the Smart Service Campus in Heerlen, a centre for new developments in the area of big data, the Internet of Things and Smart Services. Close collaboration between the campus's BISS Institute (founded by UM, Open University the Netherlands and Zuyd University of Applied Sciences) and campus partners is one of the innovative features of the MSc BISS programme. The proposal for the new MSc BISS programme was developed in close collaboration with partners in the BISS Institute.

4 Assessment per standard

This chapter presents the evaluation of the standards by the assessment panel. The panel has reproduced the criteria for each standard. For each standard the panel presents (1) a brief outline of its findings based on the programme documents, on additional documents provided by the institution and on the site visit, (2) the considerations the panel has taken into account and (3) the panel's conclusion. The panel presents a conclusion for each of the standards, as well as a final conclusion.

The assessment is based on the standards and criteria described in the NVAO Initial Accreditation Framework (Stcrt. 2014, nr 36791).

Fundamental to the assessment is a discussion with peers regarding the content and quality of the programme. It focuses on four questions:
1. What does the programme aim for?
2. How does the programme intend to achieve its objectives?
3. How does the programme intend to assess its performance?
4. Does the programme have sufficient financial resources?

These four questions have been translated into four standards. Regarding each of these standards, the assessment panel gives a substantiated judgement on a three-point scale: meets, does not meet or partially meets the standard. The panel subsequently gives a substantiated final conclusion regarding the quality of the programme, also on a three-point scale: positive, conditionally positive or negative.

4.1 Standard 1: Intended learning outcomes

The intended learning outcomes of the programme have been concretised with regard to content, level and orientation; they meet international requirements.

Outline of findings
The master's programme in Business Intelligence and Smart Services (MSc BISS) is an interdisciplinary programme with a mission to help students acquire the knowledge and competences required to analyse big data, make business decisions in data-rich environments and design data-driven smart services. The link between data science and its application in these smart services is the programme's unique feature. Graduates will be equipped with the necessary analytical tools and innovative research methods from different disciplines: marketing, service design and development, data mining, information management, business intelligence and analytics, operations research, statistics and econometrics.

The programme has been developed in close collaboration between UM and partners from the BISS Institute (Zuyd University of Applied Sciences, Open University the Netherlands and industrial partners). Thus, the learning outcomes and programme were designed to suit the industry's needs and to facilitate the continuity in higher education from (applied) bachelor's programmes to academic master's. The MSc BISS has approached several industrial partners to participate in the programme's Advisory Board, which is to be installed once the programme starts and will continually evaluate the programme. During the site visit, representatives from the industry indicated that graduates are not expected to develop

new algorithms, but to understand the underlying mathematics and statistics. They need to be able to discuss the meaning of data and translate the needs of clients into services. Some experience with programming is therefore considered useful.

The School of Business and Economics (SBE) has set four MSc-level intended learning goals that should be pursued by all MSc programmes:

1. Our graduates are able to develop insights based on academic knowledge in a self-directed manner;
2. Our graduates demonstrate an academic attitude;
3. Our graduates are able to actively engage in the global community in a globally responsible manner;
4. Our graduates demonstrate excellent interpersonal competences in an international professional setting.

Each of these goals is translated into programme-level intended learning outcomes (i.e. programme objectives) that describe how students realise the learning goals in the context of the MSc BISS. They are connected to the courses and projects by means of a curriculum map.

The first learning goal is translated into three MSc BISS-specific programme objectives on demonstrating knowledge and understanding of BISS-related frameworks, principles and methods, on applying knowledge for the analysis of business data and the implementation of smart services, and on integrating academic knowledge and business insights to develop new ideas and services. Students learn to combine different approaches from BISS-related disciplines and to co-create knowledge that crosses the borders of their own specialisation to form an integrative application view.

Three programme-specific objectives are related to the second learning goal: demonstrating academic reasoning and critical thinking based on evidence and theory; conducting research according to academic standards, from problem statement to result interpretation; and learning in a self-directed manner. Students develop an academic attitude that enables them to make meaning out of their experiences and adopt an academic frame of reference.

The two programme objectives related to the third learning goal focus on understanding and acting upon the needs and restrictions of the direct service system stakeholders, and assessing the societal and ethical implications of decisions at large. Graduates should be able to see interrelationships at different levels of analysis (society, community, organisation, individuals) and to think beyond the boundaries of their discipline when assessing the consequences of actions or decisions.

The final two programme objectives, as a translation of the fourth learning goal, aim at communicating in a clear and effective manner and being able to successfully work together and manage projects in interdisciplinary teams. Apart from being able to communicate with fellow students from potentially different backgrounds, students also learn to communicate their knowledge and findings to non-academic specialists and practitioners.

Considerations

The panel has seen a master's programme with a direct connection to the industry. The central position of Service Design within the programme sets the MSc BISS apart from related programmes and is valued by both the industry and the panel. Despite its practical focus, the panel is of the opinion that the programme manages to maintain an academic

master's level, as is specified in the programme objectives related to e.g. academic knowledge and analytical skills, methodology and soft skills – and the related assessment methods used to evaluate these competences.

The panel is of the opinion that the learning outcomes and programme objectives are well-developed and in line with the SBE MSc-level learning goals. The programme has created a curriculum map that clearly shows the connection between the learning outcomes, the Dublin descriptors and the programme's courses with their respective instructional approaches and assessment methods. The panel considers this matrix to be helpful to the staff in designing the programme and assessment methods.

The programme objectives combine different fields of expertise within UM: information management, quantitative economics, and service design. The panel was pleased to read that the learning outcomes had been updated since the information dossier was sent and that the topics 'ethics' and 'privacy' are now explicitly mentioned. It encourages the programme to additionally include legal aspects in the learning outcomes, in order to ensure that these aspects are sufficiently incorporated and assessed in the programme.

Finally, the panel applauds the formation of an Advisory Board with external members. The panel believes that this connection to industrial partners is a good way to promote the programme, essential to provide the students access to real world data, and also a guarantee to match the needs of the corporate world with the learning outcomes of the programme on a regular basis.

The panel concludes that the programme's focus is relevant and meets the needs of the industry. The intended learning outcomes have been properly developed and the panel considers standard 1 to be of a satisfactory level.

Conclusion
The programme meets standard 1.

4.2 Standard 2: Teaching-learning environment

The curriculum, staff and programme-specific services and facilities enable incoming students to achieve the intended learning outcomes.

Outline of findings
Students work on the intended learning outcomes in courses, projects and workshops. The BISS curriculum consists of five courses (5 EC each), two Smart Service Innovation Projects (SSIP; 7 EC each), the MSc thesis (17 EC) and a Study Coaching Trajectory (SCT; 4 EC). The first semester consists of three core introductory courses and a skills course that prepares students for writing their MSc thesis. During the second semester, students specialise in one of MSc BISS's three specialisations (Business Analytics, Business Intelligence Systems, or Service Design) and follow two specialisation-related courses. They also finish their thesis, which may be combined with an internship.

The SSIPs run parallel to the courses and combine project-based and blended learning (online and face-to-face, e.g. workshops, lectures). During the SSIPs, students are grouped in multidisciplinary teams of five students, representing the three specialisations. They work

on semi-structured real-life cases (research projects) that are prepared in collaboration with companies. Company representatives and a team coach support the team, while a UM project supervisor monitors the team's progress. Students learn to apply their newly acquired broad basic knowledge and existing specialist knowledge, and to understand and integrate information from different specialisations. Thus the programme shapes graduates into 'T-shaped persons', who are specialists in their own discipline but also able to interact with specialists with different expertise. Although UM has experience with collaboration between students and industry in projects, the structural embedding of these projects in the MSc BISS is new.

Experiences from other multidisciplinary programmes, such as the master's programme Management of Learning (MoL), show that 'free riding' does not occur in project-based learning as long as the group tasks are challenging enough – an aspect the programme management carefully monitors. In addition, students' progress is the central topic of the SCT and the programme has embedded peer assessment in the SSIPs, which is expected to prevent free riding while also supporting students in developing effective communication and reflection skills.

SBE has made agreements with industrial partners from the BISS Institute about projects and the availability of data in order to ensure that students can work with real data. The programme management will closely monitor and develop the available projects, as well as prepare additional projects that can be used in case not enough projects or data sets are provided by partners. Thus the programme seeks to limit the risks of study delays due to limited availability of real data or projects.

The SCT is based on a similar component from MoL, where it has been successfully implemented. The SCT supports students in their personal development and helps them to determine and achieve their personal learning goals. This part of the curriculum runs throughout the entire programme and consists of regular meetings with a personal coach.

Topics such as ethics and legal aspects are addressed during the core courses 'Service Design' and 'Business Intelligence for Smart Services'. The course 'Interaction Design', part of the Service Design specialisation, again addresses ethics, privacy and legal aspects. SBE works in close collaboration with UM's Law School on these topics. The programme management and representatives from the industry indicated that special attention should be paid to these topics at the start of the projects since they will probably 'pop up' during the projects. In the SCT, the coaches guarantee that students are supported with additional information when necessary.

The MSc BISS incorporates UM's didactic concepts of 'international classroom' and 'problem-based learning' (PBL) in addition to project-based learning via the SSIPs. Student groups are formed as internationally as possible and lecturers actively encourage students of different nationalities to work together. The students whom the panel met with spoke very positively about their experiences with UM's international classroom. PBL engages students in the investigation of authentic complex problems, thus promoting a deep understanding of subject matter in conjunction with the development of higher order thinking skills. MSc BISS students study the various subjects in small groups of up to 14 participants ('tutorials'). Case studies, often based on real-life issues from the business sector serve as a starting point for group discussions, in which problems are solved on the basis of academic literature.

It is expected that the MSc BISS appeals to both national and international students from a variety of backgrounds. Students from several programmes, among which students from Zuyd University of Applied Sciences who have completed an academic bachelor's programme or minor, are admissible to the MSc BISS. The programme has described the requirements for students who are not directly admissible. All applications go through an admission procedure and are reviewed by a Board of Admissions. Students who encounter difficulties due to a lack of knowledge or (academic) skills are supported by the programme's faculty, who are extensively briefed on this and who will prepare extra materials and assignments. The programme's personal approach with use of PBL and the SCT should ensure that problems are detected early and addressed adequately. In addition, the SSIP workshops function as a bridge between the courses and projects and support just-in-time learning.

Most of the MSc BISS curriculum is followed at SBE's urban campus in Maastricht. The facilities are meant to serve as a high quality learning environment, research environment and social environment. MSc BISS students may use the facilities of the BISS Institute in Heerlen to work on the SSIPs. SBE's Service Science Factory offers facilities designed for service innovation projects. Per SSIP, students are expected to meet at least four times at this campus for 'milestone meetings' (e.g. kick-off and presentations), but the campus facilities are also available for regular teamwork or meetings with supervisors and company representatives. The campus building hosts an ecosystem for research, development and education, in which companies and knowledge institutions engage in co-creation. All stakeholders whom the panel met with, including the students, were very enthusiastic about the vibrant atmosphere at the BISS Institute.

The Electronic Learning Environment of Maastricht University (EleUM), based on Blackboard, supports both students and staff. EleUM can be used to share information and submit assignments, while it also serves as a discussion and interaction platform. An e-portfolio is the digital support system of the SCT. A collaborative tool is used as an interface between students, teaching staff and company representatives in the SSIPs. SBE offers a range of support and counselling services that help students when needed and that ensure they can concentrate on their studies. Specific support is given to disabled students.

SBE's teaching staff is involved for a total of 2.34 fte in most of the courses to ensure the integrative nature of the study programme. They cover the full range of expertise that is addressed in the MSc BISS. Additionally, one external educator from Zuyd University of Applied Sciences is employed, as well as guest lecturers. For every part of the programme (i.e. programme management, course coordination and tutoring, project coordination and coaching, SCT coordination and coaching, thesis coordination, tutoring and supervision) a number of hours has been assigned based on experience in other programmes. Supervisors from industrial partners are carefully selected and supported by means of co-teaching.

Teachers are systematically trained on working with the PBL approach and an advanced training on tutoring has been set up to prepare the staff for this coaching-intensive programme. All professors and lecturers are required to obtain the BKO teacher qualification. Everyone involved in teaching at SBE follows a compulsory in-house tutor training. SBE delivers training programmes on international awareness, student integration and intercultural cooperation, aimed at both Dutch and non-Dutch students and employees.

The quality of MSc education is continuously monitored by the Programme Committee (PC), with representatives from all SBE programmes. The PC advises the SBE Board on the education and examination regulations and all other relevant educational matters. In addition, the SBE Council, consisting of representatives of the student and staff population, can issue advice to the SBE board, solicited or otherwise, on all Faculty affairs and make known its positions on educational affairs. SBE's Assurance of Learning system enables internal audit panels to periodically evaluate whether the programme meets the programme objectives.

Considerations
According to the panel, the curriculum is innovative while at the same time building on UM's previous experiences from related programmes. The panel considers the curriculum to be well-designed, offering an adequate mix of broad and specialist knowledge. The three specialisations are fitting and have been clearly incorporated in the curriculum. The panel appreciates that students can choose for one of three specialisations, while being stimulated to cooperate with those who opted for a different specialisation through interdisciplinary projects. Because of the essential role of the projects, the panel encourages the programme to observe their level of complexity carefully in order to ensure that they are challenging enough.

The MSc BISS clearly benefits from the long-term contacts with industrial partners via the BISS Institute. The SSIPs are a real asset as they give students direct experience in the industry. The panel established that all those involved are aware of the possible bottlenecks surrounding the SSIPs and that the programme takes measures to limit risks related to the availability of data as much as possible. In this respect, the importance of proper relation management with industrial partners cannot be stressed too much. Additionally, the panel encourages the programme to pay sufficient attention to providing enough facilities for data processing and to monitor the international character of the projects, in order to keep them in line with the programme objectives.

It is expected that students with different backgrounds apply for the programme. The panel asks the programme to communicate the entry requirements and envisioned graduation level regarding mathematics and programming skills clearly to candidates. The panel could not find this information in the programme's documents and promotional materials but considers it important in order to manage expectations. Upon enrolment, it is vital that sufficient attention is paid to the needs of students coming from different (academic) backgrounds. The panel established that the programme is very much aware of this challenge and it considers the amount of guidance and feedback students receive a strength. In the SCT students monitor their own learning progress and goals via a personal development plan, and they are encouraged to develop their reflection skills through self- and peer assessment. Therefore the panel expects that the programme will be able to adequately address the needs of individual students and, whenever necessary, to additionally support them in the development of their knowledge and skills.

The panel met with qualified and highly motivated staff: programme managers, lecturers and coaches are eager to contribute to this new programme. The panel is satisfied with the opportunities for professional and didactical development already in place for the staff – especially with the advanced training on coaching that was specifically prepared for MSc BISS staff. The teaching staff is aware of the considerable time investment required, but also regards the programme as a learning opportunity. The staff acknowledges the added

value of the SCT and regards the preparations of the projects as beneficial for their own research agenda – and the panel considers this to be a good link to the programme's academic side. Considering the attractive nature of the programme and the consequences this may have for the size of the student population, as well as the contact-intensive teaching modes that are used and their novelty, the panel strongly recommends to carefully monitor the staff's workload and to generate additional resources if necessary.

The panel concludes that the programme has developed an appropriate curriculum with fitting teaching modes. It is convinced that the staff and the facilities in place adequately support the programme and therefore it deems standard 2 to be of a satisfactory level.

Conclusion
The programme meets standard 2.

4.3 Standard 3: Assessment

The programme has an adequate assessment system in place.

Outline of findings
The programme employs various assessment forms at both the group and individual level in order to align assessment with both the programme objectives and the instructional approach (e.g. problem-based learning, project-based learning, workshops). Students are always assessed by UM examiners; industrial supervisors only have an advisory role, when appropriate.

Four main forms of assessment are used:
1. SSIP deliverables: a report on the project question, including argumentation based on theoretical insights, a student team presentation of project outcomes and other tailor-made deliverables (e.g. a flyer or a website);
2. argumentative papers, assessing the level of knowledge and insights that individual students have developed in the courses and applied in their projects;
3. an SCT portfolio that is developed throughout the programme, including a written final evaluation and a presentation;
4. the MSc thesis.

In addition, other forms of assessment (e.g. examinations, poster presentations, progress reports) are applied in those courses where good command of specific skills or knowledge is relevant.

The project deliverables are assessed on both the individual and the team level. The final grade incorporates self-evaluation, peer evaluation, input from the company representative, as well as the team coach's and academic supervisor's judgements. The SCT portfolio is assessed with a pass or a fail at the end of the year by a committee consisting of the coach and a company representative. The MSc thesis is independently assessed by the supervisor and a second reader (a Faculty member or a PhD student of the SBE). A standard electronic assessment form is used in order to ensure valid and reliable assessment of the thesis.

During the programme, attention is paid to critical self-reflection and to dealing with feedback. These competences are embedded in multiple parts of the curriculum, such as

the SSIP and SCT. The programme uses the CATME scale for peer assessment. Attending tutorial group meetings is considered to be essential for the optimal functioning of the groups and thus for achieving an optimal learning process. Group meetings are therefore mandatory and active participation is part of the overall assessment.

SBE's Board of Examiners (BoE) is responsible at the School level for safeguarding the quality of examinations and assuring that students achieve the intended learning outcomes. The BoE is supported by an Assessment Committee (AC), also at the School level, which monitors the quality of the assessment process. The AC advises course coordinators on how to construct, score and analyse assessments, and monitors and improves the quality of assessments. All assessments within the MSc BISS are in line with the UM's MSc Education and Exams Regulations. This includes resits, right of inspection, hardship, fraud/plagiarism, and examination arrangements for disabled students.

Considerations
The panel encountered an assessment system with various assessment methods that are in line with the programme objectives and curriculum. Students are not only assessed summatively but also formatively through the SCT and the application of peer assessment. The programme has developed adequate assessment forms that provide guidelines to examiners. The panel deems it fitting that the company supervisors have an advisory role in the assessment procedures, as UM examiners thus ensure the programme's academic master level.

Assessment is supported by SBE's assessment policies and structures. The BoE and AC are considered to be well-prepared for their tasks and able to safeguard the quality of examinations. Considering that the topics 'ethics', 'privacy' and 'legal aspects' are part of multiple courses, the panel is of the opinion that assessment of these topics is challenging. It therefore recommends that the AC pays close attention to the incorporation of these topics in the various assessment methods – also following the recent reformulation of learning outcomes. Furthermore, the panel asks the BoE to monitor the SSIPs and keep an eye on possible delays that are out of students' control.

All in all, the panel was satisfied with the assessment system in place and considers standard 3 to be of a satisfactory level.

Conclusion
The programme meets standard 3.

4.4 Standard 4: Graduation guarantee and financial provisions

The institution guarantees students that they can complete the entire curriculum and makes sufficient financial provisions available.

Outline of findings
During the site visit, the SBE Board expressed the guarantee that students who enrol in the programme will be able to finish the entire programme within a reasonable time period. This was additionally confirmed during the site visit with a letter from the SBE dean. The institution has estimated the revenues and costs related to the programme, showing a

positive result by 2022. The SBE board ensured that the university possesses sufficient funds to support the development and implementation of the programme.

Considerations
According to the panel, there are sufficient guarantees in place to ensure that students are able to obtain their degree. The programme aligns with UM's strategic objectives, with a greater focus on beta science education. The (conservatively composed) financial overview shows that SBE is committed to the MSc BISS and willing to invest in the programme.

Conclusion
The programme meets standard 4.

4.5 Conclusion

The panel considers the master's programme Business Intelligence and Smart Services to be well-developed, relevant and distinctive from related programmes due to the central position of Service Design. The programme has a practical focus, with a direct connection to the industry, while maintaining an academic master's level that is clearly visible in the programme objectives and related assessment methods.

According to the panel, the curriculum is innovative with fitting teaching modes, offering an adequate mix of broad and specialist knowledge. Students choose one of three specialisations, but cooperate with the others through interdisciplinary projects. These projects give students hands-on experience in the industry and the panel considers them to be a real asset to the programme. The panel establishes that all stakeholders are aware of the possible bottlenecks surrounding the availability of real data and projects and that the programme takes measures to limit risks as much as possible.

The programme is very much aware of the challenges related to dealing with a diverse student population and the panel considers the amount of guidance and feedback students receive a strength. The panel expects that the programme will be able to adequately address the needs of individual students and, whenever necessary, to additionally support them in the development of their knowledge and skills. It encountered sufficient guarantees to ensure that students are able to obtain their degree.

The panel is contended to have met with qualified and highly motivated staff and it is satisfied with the opportunities for professional and didactical development already in place for the staff. The teaching staff is aware of the considerable time investment required. Still, the panel strongly recommends to carefully monitor the staff's workload and to generate additional resources if necessary.

The panel appreciates the programme's appropriate assessment system with various assessment methods that are in line with the programme objectives and curriculum. Considering that the topics 'ethics', 'privacy' and 'legal aspects' are part of multiple courses, the panel asks special attention for the assessment of these topics.

The panel expresses its appreciation for the discussions with all those involved in the programme, which strengthened the panel's belief that the programme is well-prepared and

widely supported. The panel concludes that the programme meets all standards and assesses the quality of the programme as positive.

4.6 Recommendations

Based on the findings, the panel formulated the following recommendations:
- take sufficient measures to avoid potential delays in study progress due to lack of data or data processing resources; in this light, continue investing in relation management with industrial partners, in order to limit as much as possible risks related to working with real data resources and real projects;
- carefully monitor the staff's workload and be prepared to generate additional resources whenever this proves to be necessary;
- safeguard that the topics 'ethics', 'privacy' and 'legal aspects' are assessed sufficiently, considering that they are part of multiple courses.

4.7 Qualification and field of study (CROHO)

The panel advises to award the degree 'Master of Science' to the master's programme Business Intelligence and Smart Services. The panel supports the programme's preference for the CROHO field of study 'economics'.

5 Overview of the assessments

Standard	Assessment
1. Intended learning outcomes The intended learning outcomes of the programme have been concretised with regard to content, level and orientation; they meet international requirements.	Meets the standard
2. Teaching-learning environment The curriculum, staff and programme-specific services and facilities enable incoming students to achieve the intended learning outcomes.	Meets the standard
3. Assessment The programme has an adequate assessment system in place.	Meets the standard
4. Graduation guarantee and financial provisions The institution guarantees students that they can complete the entire curriculum and makes sufficient financial provisions available.	Meets the standard
Conclusion	Positive

Annex 1: Composition of the panel

Prof. W. Van Petegem (chair)
Wim Van Petegem holds an MSc degree in Electrical Engineering from the University of Ghent and one in Biomedical Engineering from the KU Leuven. He obtained his PhD in Electrical Engineering from KU Leuven in 1993. He has worked at the University of Alberta, Edmonton (Canada), at the Open University (the Netherlands) and at Leuven University College. From 2001 until 2012 he was head of the Media and Learning Center (formerly known as AVNet) and later Director of the Teaching and Learning Department at KU Leuven. He is currently Professor at the Faculty of Engineering Technology at KU Leuven, where he is Policy coordinator Learning Technologies. Wim is actively involved in different university networks (e.g. EuroPACE, SEFI, EDEN, IACEE, MEDEA and the Coimbra Group). His current research interests are in the field of multimedia production, new educational technology, networked e-learning, virtual mobility, lifelong learning, open and distance learning, knowledge transfer, innovative entrepreneurship and science communication. He and his team are involved as contractor, partner, coordinator, expert, or evaluator in many implementation and development projects mostly financed by the European Commission (DG Education and Culture). He is also heavily engaged in development cooperation with the South, and volunteer board member of several non-profit organisations.

Prof. S. Klous
Sander Klous is professor in Big Data Ecosystems for Business and Society at the University of Amsterdam. His research focuses on how business and society can maximise the benefits of insights gained through big data analysis. Sander obtained a PhD in High Energy Physics (HEP) and worked on a number of projects for CERN. He received several grants and awards related to high performance distributed computing in physics and has numerous publications in this area. In addition, he is partner in charge of Data & Analytics at KPMG Advisory in the Netherlands and member of the global Data & Analytics leadership team of KPMG. After his transition to industry, he mainly worked on technical and organisational analytics challenges for middle size and large (international) organisations with complex computing infrastructures.
Sander is the founder of the Big Data team at KPMG in the Netherlands, where he built a team of former CERN PhD graduates to deliver Big Data services to major players in Telecom, Finance, Health, Retail and other sectors. He has over a decade of experience in large scale distributed computing, real-time systems and data processing technologies. During those years he has been responsible for designing, implementing and managing a range of distributed computing services, including systems involving Big Data processing and advanced analytics.

A. van Dijk MMC RI
Arjan van Dijk is managing director Solution Management at Cegeka-DSA, a company delivering software and service to the real estate market. He is responsible for business development and optimally adjusting the different parts of Cegeka-DSA's portfolio, as well as further standardisation of solutions, e.g. by fully supporting CORA (Corporatie Referentie Architectuur) and VERA (Volkshuisvesting Enterprise Referentie Architectuur) standards. Arjan assists the collaboration between Cegeka-DSA and other parties and stimulates such collaborations in order to establish a harmonised software platform for housing associations. He is an international expert on computer science, information science, information services and information management.

L.V.R. van Doremalen (student member)
Lennart van Doremalen is a PhD candidate at the institute of Subatomic Physics at Utrecht University. He studied the research master 'Experimental Physics' and the bachelor 'Physics and Astronomy' at the same university . During his studies, he was co-founder of the student party Lijst Helder and student representative for this party in UU's University Council. From 2009 until 2010 he was the student board member of the Department of Physics. In 2012, he organised the International Conference of Physics Students (ICPS) in collaboration with fellow students. In addition, Lennart was an active member of the national student union LSVb, the local student union VIDIUS, and fulfilled several functions as board member or advisor next to his studies. He is also co-founder of the Utrecht city council party Student & Starter.

This composition reflects the expertise deemed necessary by NVAO. All panel members signed a statement of independence and confidentiality.

On behalf of the NVAO, Liza Kozlowska and Anne Martens, NVAO policy advisors, were responsible for the process-coordination and the drafting of the experts' report.

Annex 2: Schedule of the site visit

The panel visited Maastricht University on March 8th, 2017 as part of the external assessment procedure regarding the wo-master Business Intelligence and Smart Services.

08:30 – 09:00 **Preparatory panel meeting** *(confidential)*

09:00 – 09:30 **SBE Board**
- Prof. Philip Vergauwen, dean
- Dr. Huub Meijers, associate dean of Education

09:30 – 10:30 **Programme management**
- Dr. Isabella Grabner, MSc Director
- Dr. Alexander Grigoriev, programme leader MSc BISS
- Dr. Bram Foubert, programme leader MSc BISS
- Prof. Mien Segers, Educational Research and Development

10:45 – 11:45 **Faculty meeting**
- Dr. Nalan Bastürk (Analytics)
- Dr. Niels Holtrop (Analytics)
- Dr. Rui Jorge Almeida (Analytics)
- Prof. Gaby Odekerken (Service Design)
- Dr. Benjamin Lucas (Service Design)
- Dr Visara Urovi (Business Intelligence Systems)
- Dr. Simon Beauseart (Study Coaching Trajectory & Projects)
- Prof. Rudolf Müller (Projects)

11:45 – 12:30 **Board of Examiners, Programme Committees, Assessment Committee, Student Advising & Academic Counselling**
- Dr. Eric de Regt, chair Board of Examiners
- Prof. Hans Kasper, chair Programme Committees
- Dr. Dirk Tempelaar, chair Assessment Committee
- Wim Bogaert MEd, manager Student Advising & Academic Counselling

12:30 – 13:30 **Lunch**

13:30 – 14:00 **Representatives from the industry**
- Ms Sofie de Broe, Head of methodology at Statistics Netherlands
- Mr Pierre Veelen, Enterprise Architect at KPN
- Mr Roger Bons, Co-Founder Dark Data Company

14:00 – 14:30 **SBE's MSc students**
- Florian Knäple, MSc student Business Research
- Tom Kennes, MSc student Economic & Financial Research
- Marten Laudi, MSc student Business Research

14:30 – 16:00 **Panel meeting** *(confidential)*

16:00 **Presentation of initial findings**

Annex 3: Documents reviewed

Programme documents presented by the institution

- Information dossier
- Appendices to the information dossier:
  - Besluit macrodoelmatigheid MinOCW mbt MSc BISS
  - Subject-specific reference framework
  - Inhoudsbeschrijving
  - SBE MSc BISS - EER 16-17
  - Overview Of Faculty Members
  - Connection to labour market
  - Intended student-staff ratio
  - Intended number of face-to-face hours for each course year
  - Structure and governance of SBE
  - Dublin Descriptors
  - MSc Thesis Evaluation form
  - Programmes included for GMAT GRE exemption
- Documents made available via a digital base room:
  - General
    - Information on PBL
    - Handbook for Teaching Staff
    - SBE Quality Assurance Handbook
    - PC Annual Report 2014/15
    - MSc BISS Curriculum map
    - Business Intelligence & Smart Services Institute
    - MSc BISS report for NVAO
    - Addendum – MSc BISS report for NVAO
  - Assessment – General
    - SBE Assessment Policy
    - MSc Education & Examination Regulations
    - BoE Annual Report (2012/2013/2014)
    - SBE Assessment Commitee Annual Report 2015
    - MSc Thesis Code of Practice
    - Samples Assessment Blueprints
    - SBE Complaints Regulations
    - Rules of Procedure for Examinations
  - Assessment – BISS Samples
    - Study Coaching Trajectory – Screenshots
    - Business Analytics – Exam
    - Smart Service Innovation Projects – Assessment
    - Business Analytics – Assessment Blueprint
    - MSc Thesis Score Form
  - Assessment – Other Samples
    - Customer Analysis
    - Supply Chain Relationships
    - Theories and Models of Learning
  - BISS Course Manuals
    - Advanced Data Systems for Smart Services
    - Business Analytics

    - Business Intelligence for Smart Services
    - Data Visualization
    - Descriptive and Predictive Analytics
    - Interaction Design
    - Service Design
    - Smart Decision Support Systems
    - Smart Service Innovation Projects
    - Study Coaching Trajectory
    - Value Proposition and Pricing of Smart Services
    - Master Thesis
- Documents made available during the site visit
    - Letter from Prof. P.G.M.C. Vergauwen, SBE dean
    - MSc BISS – Calculated workload; estimation for 1st year

Annex 4: List of abbreviations

AC	Assessment Committee
BKO	Basic Teaching Qualification (‘Basis Kwalificatie Onderwijs’)
BoE	Board of Examiners
EC	European Credit
EER	Education and Examination Regulations
ma	master’s programme
MoL	master’s programme in Management of Learning
MSc BISS	master’s programme in Business Intelligence and Smart Services
NVAO	Accreditation Organisation of the Netherlands and Flanders
PBL	problem-based learning
PC	Programme Committee
SBE	School of Business and Economics
SCT	Study Coaching Trajectory
SSIP	Smart Service Innovation Project
UM	Maastricht University
wo	higher education, scientific orientation (‘wetenschappelijk onderwijs’)

The panel report was ordered by NVAO for the initial accreditation of the programme wo-master Business Intelligence and Smart Services of Maastricht University.

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