HIGHER EDUCATION COORDINATING COMMISSION
255 Capitol Street NE, Salem, OR 97310
www.oregon.gov/HigherEd

Docket Item:

University Program Approval: Portland State University, Master of Science (M.S.) in Applied Data Science for Business.

Summary:

Portland State University proposes a new degree program leading to a M.S. in Applied Data Science for Business. The statewide Provosts' Council has unanimously recommended approval. Higher Education Coordinating Commission (HECC) staff completed a review of the proposed program. After Analysis, HECC staff recommends approval of the program as proposed.

Staff Recommendation:

The HECC recommends the adoption of the following resolution:

> RESOLVED, that the Higher Education Coordinating Commission approve the following program:
>
> M.S., in Applied Data Science for Business at Portland State University.

Portland State University seeks the Oregon Higher Education Coordinating Commission approval to offer an instructional program leading to a M.S. in Applied Data Science for Business.

Program Description and Justification

1. Identify the institution, degree, and title of the program.

Portland State University
M.S. in Applied Data Science for Business

2. Describe the purpose and relationship of the proposed program to the institution's mission and strategic plan.

The M.S. in Applied Data Science for Business will allow business professionals to achieve leadership positions that involve the integration of technology into business process. Without the exposure to technologies, business models, and organization management skills developed in this Master, students and alumni in the era of Business 4.0 (big data, cloud computing, AI, IoT, Blockchain) will be left behind. Two of the certificates in this Master (HR Analytics and the Business Blockchain Certificate) have online video primers that will allow access for people with limited background in math and statistics. Few similar Master's programs across the United States have primers to improve inclusion in more technical subject matter.

In The School of Business, one of the initiatives of our Strategic Plan is called Education 4.0, with one of the programs in this initiative is called "Hot Topics Courses," and this Master would address the goal of introducing courses that are in new fields.

In terms of PSU's recently launched signature research centers https://www.pdx.edu/insidepsu/psu-launches-research-centers-for-homelessness-and-future-cities, the technologies addressed in this new Master, including Internet of Things and AI, will play critical roles in the smart city infrastructure.

3. What evidence of need does the institution have for the program?

Regarding employment opportunities, opportunities are present even when searches incorporate new job areas involving digital transformation and blockchain. The BIA and HR Analytics certificates set students up for numerous job opportunities around the country.

Data from Burning Glass (through end-January, 2019) reflect that the business analyst position provides robust employment opportunities in the region and nationally. The projected key competencies for business analysts going forward include data science and Machine Learning, which are content areas of this Master. Further assessment of demand and employment opportunities were assessed with interviews

The online delivery mode of the MSADSB will foster reach across the state and region. This new Master's program will provide upskilling in Business 4.0 fields that are becoming a requirement not only for advancement but even for entry-level jobs (e.g., Business Analyst positions can require working knowledge of analytics). Our inclusion of not only our graduate students but working professionals as a target audience for this Master speaks to the need to upskill the current workforce in addition to the future one. The range of sectors that are looking toward upskilling with analytics is vast from high-tech to retail. The people graduating from this Master's program will have foundational skills that can translate easily across sectors, giving them long-term career stability.

4. Are there similar programs in the state? If so, how does the proposed program supplement, complement, or collaborate with those programs?

We are negotiating a collaborative agreement with OSU's Business School around our Supply Chain Management graduate offerings, where their students can take 12 units from our Global Supply Chain Management program and our students can take 12 units from their program. We could envision a similar collaboration with their MBA in Analytics program and this new Master's program.

We are in close contact with the leaders in ETM, Systems Science, and Mathematics/Statistics who are teaching in PSU's existing Business Intelligence & Analytics certificate, which is part of this Master's program. We reached out to the Computer Science department regarding our new Business Blockchain Certificate and will continue to be in touch with them.

We will continue to collaborate with leaders at companies across the region to include them as guest speakers and tap them for course projects across the core curriculum in the Master.

All appropriate University committees and the Statewide Provosts Council have approved the proposed program. The Portland State University Board of Trustees approved the program on April 2, 2020.

Recommendation to the Commission

The Statewide Provosts Council recommends that the Oregon Higher Education Coordinating Commission authorize Portland State University to establish an instructional program leading to a M.S. in Applied Data Science for Business, effective fall 2020**.**

HIGHER EDUCATION COORDINATING COMMISSION

Proposal for a New Academic Program

Institution: Portland State University

College/School: School of Business

Department/Program Name: Business Administration

Degree and Program Title: M.S. in Applied Data Science for Business

1. Program Description

a. Proposed Classification of Instructional Programs (CIP) number.

52.1399 Management Science and Quantitative Methods

b. Brief overview (1-2 paragraphs) of the proposed program, including its disciplinary foundations and connections; program objectives; programmatic focus; degree, certificate, minor, and concentrations offered.

The objective of the Master of Science in Applied Data Science for Business (MSADSB) is to impart the knowledge and skills required to lead organizations through digital transformation. The so-called fourth industrial revolution that is unfolding can be characterized by big data and artificial intelligence (AI), among other dimensions. Related technologies such as cloud services, the Internet of Things (IoT), machine learning (ML), robotic process automation, neural networks, natural language processing, and blockchain, taken collectively, constitute the digital transformation confronting private sector and public sector organizations. Managers across sectors face decisions not only around technology adoption but fundamental questions of how their organizations create value; the fundamental approach to delivering value to their customers, i.e., their business model; and the responsibility of ethically using customer data while ensuring data security. Business leaders need to learn how to work closely with data scientists to make these decisions.

Only by understanding these new technologies, their interaction, and the data analyses made possible by their integration, can business leaders pursue proactive strategies rather than reactive ones. Digital transformation affects and potentially disrupts virtually every function in the organization – product development, customer management, supply chain management, marketing, HR, finance, and accounting. Additionally, the new digital technologies blur and erase the boundaries between organizations and will disrupt entire industries. To succeed in this environment business leaders will need to take a holistic approach in reinventing their products, processes and strategies. These changes offer opportunities for both start-ups and existing businesses for product and service innovation and new ways of rapidly scaling their operations. Through this Master's program, students will learn the strategic mindset to navigate the digital transformation of their organizations, as well as the actionable skills that are in demand by organizations across the globe.

c. Course of study – proposed curriculum, including course numbers, titles, and credit hours.

The Master of Science in Applied Data Science for Business (MSADSB) focuses on the needs of business leaders to understand digital transformation and the importance of data science across functional areas. In addition to the core curriculum, students must complete at least 1 approved certificate plus additional credits from any of the other approved certificates or electives to complete a minimum of 45 credits. The core curriculum imparts the business fundamentals of accounting and strategy; the critical business implications of digital transformation and the organizational change that it will necessitate; the regulatory, ethical, and cybersecurity imperatives governing digital transformation; and an introduction to technical skills.

The curriculum:

22 core credits

[24 core credits if a data visualization course is not offered in chosen certificate.]
1) (4 credits) *Mgmt 518. Digital Transformation of Business*
2) (4 credits) *Mgmt 519. Digital Transformation: Security, Privacy & Ethics*
3) (4 credits) *Mgmt 520. Leading Organizational Change During Digital Transformation*
4) (2 credits) *ISQA 522. Special Topics in Data Science, Technology for Business: Data Structures for Business Applications*
5) (2 credits) *ISQA 523. Special Topics in Data Science: Machine Learning Applications for Managers*
6) (4 credits) *GSCM 512. Managerial and Cost Accounting**
7) (2 credits) *GSCM 520. Strategy**
8) (2 credits) *ISQA 521. Data Visualization*. Required in core if no data visualization course in chosen certificate]

+ minimum of 23 credits: must complete at least 1 of these approved Certificates and take the balance of credits from any of the other Certificates or elective courses approved by Academic Director.

[+ minimum of 21 credits if data visualization course taken in core; must complete at least 1 of these Certificates and take the balance of credits from any of the other Certificates or elective courses approved by Academic Director.]

<*Other similar existing graduate business courses like Financial Reporting: ACTG 511 (4 credits) and Foundations of Strategy: MGMT 511 (2 credits) in the MBA program could substitute for GSCM 512 and GSCM 520, respectively.>

The Certificates approved for this Master's program are:

1) (18 credits) Human Resource Analytics (HRA) Certificate (2019-20 Bulletin link: http://pdx.smartcatalogiq.com/2019-2020/Bulletin/The-School-of-Business/Graduate-Certificates/Human-Resource-Analytics-Grad-Certificate)

2) (21 credits) Business Intelligence & Analytics (BIA) Certificate (2019-20 Bulletin link: http://pdx.smartcatalogiq.com/2019-2020/Bulletin/The-School-of-Business/Graduate-Certificates/Business-Intelligence-and-Analytics)

3) (18 credits) Business Blockchain Certificate (BBC) (2019-20 Bulletin link: http://pdx.smartcatalogiq.com/2019-2020/Bulletin/The-School-of-Business/Graduate-Certificates/Business-Blockchain-Graduate-Certificate)

d. Manner in which the program will be delivered, including program location (if offered outside of the main campus), course scheduling, and the use of technology (for both on-campus and off-campus delivery).

This will be an online degree.

e. Adequacy and quality of faculty delivering the program.

AACSB Accreditation provides guidelines for the share of different categories of faculty to which this program will comply. The Faculty will include fulltime (TT and NTTF) and adjunct faculty who are leaders in the fields covered in this Master's program.

f. Adequacy of faculty resources – full-time, part-time, adjunct.

Except for 3 courses, the core will be taught by full-time faculty. Each certificate differs in the mix of full-time and adjunct faculty.

g. Other staff.

An Academic Director will oversee this program. The marketing, recruitment, admissions, and retention activities for this Master's degree may be subcontracted to an external vendor. Academic advising and career advising will be provided by the Graduate Business Programs office, and a staff member will be hired. The Academic Director and staff member also will work on CO-OP experiences for the students.

h. Adequacy of facilities, library, and other resources.

The library resources available to this Master via the OAI Flexible Degree Initiative will be adequate. No additional resources will be required.

i. Anticipated start date.
Fall 2020

2. Relationship to Mission and Goals

a. Manner in which the proposed program supports the institution's mission, signature areas of focus, and strategic priorities.

The MSADSB will allow business professionals to achieve leadership positions that involve the integration of technology into business process. Without the exposure to technologies, business models, and organization management skills developed in this Master, students and alumni in the era of Business 4.0 (big data, cloud computing, AI, IoT, Blockchain) will be left behind. Two of the certificates in this Master (HR Analytics and the Business Blockchain Certificate) have online video primers that will allow access for people with limited background in math and statistics. Few similar Master's programs across the United States have primers to improve inclusion in more technical subject matter.

In The School of Business, one of the initiatives of our Strategic Plan is called Education 4.0, with one of the programs in this initiative is called "Hot Topics Courses," and this Master would address the goal of introducing courses that are in new fields.

In terms of PSU's recently launched signature research centers https://www.pdx.edu/insidepsu/psu-launches-research-centers-for-homelessness-and-

future-cities, the technologies addressed in this new Master, including Internet of Things and AI, will play critical roles in the smart city infrastructure.

b. Manner in which the proposed program contributes to institutional and statewide goals for student access and diversity, quality learning, research, knowledge creation and innovation, and economic and cultural support of Oregon and its communities.

While this could be perceived as a "techie" Master's program, the HR Analytics and the Business Blockchain certificates are designed to be accessible to students with limited technical backgrounds and/or limited prior coursework in mathematics and statistics. It will be recommended that students with these backgrounds take either of these certificates first before enrolling in the core courses of this Master. These certificates are intended to make this master accessible to underrepresented populations in STEM fields including, historically, women and underrepresented minority students.

There will be a wide variety of industry leaders interviewed regarding how digital transformation is affecting their operations and changing how work is done. The industry leaders will be chosen to represent diverse voices and backgrounds. Because of the mix of hands-on learning, lecture content, video content, and individual- and team-based assignments, diverse learning styles will be accommodated.

Courses will be developed in coordination with the Office of Academic Innovation (OAI) through the flexible degree program, using OAI guidelines and best practices to ensure the courses meet, or exceed, the University's diversity and access guidelines.

Courses will be offered in an online format. Using the online tools, instruction will be delivered via video, discussion board, posted assignments, online exams, Google Meet, etc. to offer students a number of different learning modalities.

c. Manner in which the program meets regional or statewide needs and enhances the state's capacity to:

i. improve educational attainment in the region and state;
ii. respond effectively to social, economic, and environmental challenges and opportunities; and
iii. address civic and cultural demands of citizenship.

The online delivery mode of the MSADSB will foster reach across the state and region. This new Master's program will provide upskilling in Business 4.0 fields that are becoming a requirement not only for advancement but even for entry-level jobs (e.g., Business Analyst positions can require working knowledge of analytics). Our inclusion of not only our graduate students but working professionals as a target audience for this Master speaks to the need to upskill the current workforce in addition to the future one. The range of sectors that are looking toward upskilling with analytics is vast from high-tech to retail. The people graduating from this Master's program will have foundational skills that can translate easily across sectors, giving them long-term career stability.

Embedded in discussions of digital technology development and use are shifts in power and control, typically away from central industries and authorities and toward a diverse group of organizations and individuals. As we discuss emerging topics in digital transformation, we will embed discussions of their ethical, social, and environmental implications.

Industry 4.0 technologies (including big data, cloud services, AI/ML, IoT, etc.) and related business processes and products will have much greater social impact if a diverse group of stakeholders guides their development and use. We will stress this in the courses and encourage students from all backgrounds to express and listen to a diverse range of ideas.

Overall, we are firmly committed to Diversity and Inclusion in The School of Business. One of our 7 Strategic Initiatives in our new strategic plan is Inclusive Business. Towards this end, in the certificates in this proposed Master's program (BIA, HRA and BBC), we have created bootcamp primers: critical overview material that prospective students go through for non-credit/free to make sure they are a) ready for the certificate; b) truly interested in the certificate content. We feel that underrepresented populations (e.g., women and people of color) in more technical areas of business, can be deterred unnecessarily, but with these primers should be ready to go.

3. Accreditation

a. Accrediting body or professional society that has established standards in the area in which the program lies, if applicable.

The AACSB is the business accrediting body for The School of Business.

b. Ability of the program to meet professional accreditation standards. If the program does not or cannot meet those standards, the proposal should identify the area(s) in which it is deficient and indicate steps needed to qualify the program for accreditation and date by which it would be expected to be fully accredited.

AACSB Faculty Qualification Guidelines:

[Classifications: Scholarly Academic (SA); Practice Academic (PA); Scholarly Practitioner (SP); Instructional Practitioner (IP); Other (O)]

1. Share of SA faculty: recommended 40%
2. Share of Other: less than 10%

AACSB Faculty Qualification Guidelines are in the process of being refined for 2020. One proposed change: "The ratio of SA faculty may also be fewer than the guideline should the school make appointments to drive new, innovative or interdisciplinary initiatives," and so we will carefully track the finalized version of the faculty sufficiency guidelines to ensure we are in compliance.

c. If the proposed program is a graduate program in which the institution offers an undergraduate program, proposal should identify whether or not the undergraduate program is accredited and, if not, what would be required to qualify it for accreditation.

There is not an existing corresponding undergraduate program, but we anticipate the proposed BS in Data Science in the Mathematics and Statistics Department and the proposed undergraduate option in Business Technology and Analytics in the School of Business will be natural pathways into this new Master's program.

d. If accreditation is a goal, the proposal should identify the steps being taken to achieve accreditation. If the program is not seeking accreditation, the proposal should indicate why it is not.

AACSB accreditation is a goal, and the guidelines for faculty sufficiency will be followed, as well as course content continuous improvement through the Assurance of Learning process.

4. Need

a. Anticipated fall term headcount and FTE enrollment over each of the next five years.

Year 1: 30 students; Year 2 onward: 50 students.

A number of leaders in related industries have been interviewed to understand whether they would send their staff to this Master. These interviews included leaders from Autodesk, AWS-Elemental, Daimler, Intel, Nike, The Standard, and Tektronix, and they indicated that they have employees on staff who would benefit from this Master's program.

b. Expected degrees/certificates produced over the next five years.

(1x30) + (4x50) = 230 degrees

c. Characteristics of students to be served (resident/nonresident/international; traditional/ nontraditional; full-time/part-time, etc.).

Over time, we anticipate a mix of resident (60%) and nonresident (40%), with an occasional international student. The online nature of this program will accommodate both full-time and part-time students. The students who enroll directly after finishing their undergraduate degree will be expected to be tech savvy. The returning students (e.g., with 4-8 years of work experience) will be expected to be looking to re-tool.

d. Evidence of market demand.

Regarding employment opportunities, Indeed.com searches demonstrate that employment opportunities are present even when searches incorporate new job areas involving digital transformation and blockchain. The BIA and HR Analytics certificates set students up for numerous job opportunities around the country.

Data from Burning Glass (through end-January, 2019) reflect that the business analyst position provides robust employment opportunities in the region and nationally. The projected key competencies for business analysts going forward include data science and Machine Learning, which are content areas of this Master.

Further assessment of demand and employment opportunities were assessed with interviews:

- Interview with Keith Wymbs – former CMO, AWS Elemental

According to Keith, there is a need for this type of training/curriculum for those who are in pure Business Intelligence roles and also employees from other functions, e.g., digital marketing, whose effectiveness and success is increasing dependent on acquiring these new skills. In his opinion, this applies to the larger Amazon organization beyond AWS Elemental.

- Interview with Nitin Mayande – Co-Founder & Chief Data Scientist, Tellagence (and formerly Senior Data Scientist Nike Corp).

We received positive feedback on the overall design and need for such a Master's level course. Nitin likes the potential of "…exposing the students to the real-world issues, e.g., the importance of data prep and cleaning through course/lab/capstone process." Nitin felt that a solid Visualization/Story Telling course as a core part of the curriculum would be important. The overall goal would be to makes the students effective business partners for the PhD data scientists within their company. The ability to communicate across the management-data scientist boundary is greatly needed.

- Interview with Vera Sell – Product/Solutions Manager – Tektronix

Tektronix, the test and measurement company is in the process of reinventing it-self after being bought out by the private equity firm Danaher. Vera confirmed that the focus on digital transformation, skills and knowledge related to cutting technologies like AI and Machine Learning and ability to create and refine new business models is the right focus.

Interview with Shawn Duffy – Partner & Chief Information Officer – Axian

Shawn has over 15 years of experience in the Business Intelligence field. He is the CIO at Axian, which produces custom software and data solutions. Shawn observed that this new Master would serve practicing managers who want to re-tool, as well as students straight from undergrad who have an interest in technology, but want to really apply it to business. He said the topics courses in the core coupled with one of the certificates would give a solid grounding such that a business leader completing the Master would be able to interact with a data scientist in a credible way.

e. If the program's location is shared with another similar Oregon public university program, the proposal should provide externally validated evidence of need (e.g., surveys, focus groups, documented requests, occupational/employment statistics and forecasts).

The program is online, and there are other universities like Oregon State University that offer related online Master's programs, for example OSU's MBA with an Analytics emphasis and a graduate business certificate in Analytics. OSU's offerings are most closely related to our Business Intelligence & Analytics Certificate that is one of the options in this proposal Master.

While Master's programs in Analytics are common offerings in business schools around the country, very few universities in the US are offering an HR Analytics or a Business Blockchain certificate option as part of a business Master's program.

f. Estimate the prospects for success of program graduates (employment or graduate school) and consideration of licensure, if appropriate. What are the expected career paths for students in this program?

Goal: 100% of students enrolled in the Master's program will have a CO-OP or internship in their respected certificate subject matter area.

Goal: 100% placement of graduates from this program within 1 year of graduation.

5. Outcomes and Quality Assessment

a. Expected learning outcomes of the program.

Technology Knowledge

Graduates will demonstrate an understanding of technologies and how they influence business practice such as a basic understanding of blockchain technology, analytics, or Machine Learning.

Knowledge about Ethics, Privacy, and Security issues pertaining to data

Graduates will understand how to ethically manage data consistent with laws and privacy standards.

Critical Thinking

Graduates will demonstrate strong critical thinking skills required to navigate changing business practices in the face of digital transformation including AI, IoT, big data, cloud services, etc.

Graduates will understand how business models may change due to digital transformation.

Communication

MSADSB graduates will be able to effectively convey information through visuals, writing, and behavior, and hone their storytelling abilities.

b. Methods by which the learning outcomes will be assessed and used to improve curriculum and instruction.

Assessment will be done in coordination with the assessment of the Master's learning goals above, which are required for AACSB accreditation. This assessment will be done by faculty teaching in the Master where 2 assessments will be completed for each learning goal every 5 years, and the results will be used for continuous improvement of the program. Course content will be adjusted to achieve the learning goals.

c. Nature and level of research and/or scholarly work expected of program faculty; indicators of success in those areas.

As per our AASCB accreditation requirements, it is recommended that 40% of the instruction in the Master be done by Scholarly Academic (SA) faculty, so they will need to publish 2 peer-reviewed articles in 5 years.

6. Program Integration and Collaboration

i) Closely related programs in this or other Oregon colleges and universities.

ii) Ways in which the program complements other similar programs in other Oregon institutions and other related programs at this institution. Proposal should identify the potential for collaboration.

iii) If applicable, proposal should state why this program may not be collaborating with existing similar programs.

iv) Potential impacts on other programs.

We are negotiating a collaborative agreement with OSU's Business School around our Supply Chain Management graduate offerings, where their students can take 12 units from our Global Supply Chain Management program and our students can take 12 units from their program. We could envision a similar collaboration with their MBA in Analytics program and this new Master's program.

We are in close contact with the leaders in ETM, Systems Science, and Mathematics/Statistics who are teaching in PSU's existing Business Intelligence & Analytics certificate, which is part of this Master's program. We reached out to the Computer Science department regarding our new Business Blockchain Certificate and will continue to be in touch with them.

We will continue to collaborate with leaders at companies across the region to include them as guest speakers and tap them for course projects across the core curriculum in the Master.

7. External Review

If the proposed program is a graduate level program, follow the guidelines provided in *External Review of New Graduate Level Academic Programs* in addition to completing all of the above information.

External review report has been completed.

Institution: Portland State University
Program: MS in Applied Data Science for Business

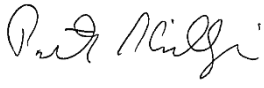
Action: At the **May 7, 2020** meeting, the Statewide Provosts Council approved a new program for **PSU, MS in Applied Data Science for Business** to move forward to the Oregon Higher Education Coordinating Commission for its review and approval. The **PSU** Board of Trustees approved the **MS in Applied Data Science for Business** program at its **April 9, 2020** meeting.

Eastern Oregon University
Sarah Witte, provost
X Approved
__Opposed
__Abstained

Oregon State University
Ed Feser, provost
X Approved
__Opposed
__Abstained

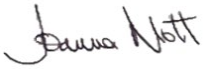
Portland State University
Susan Jeffords, provost
X Approved
__Opposed
__Abstained

University of Oregon
Patrick Phillips, provost
X Approved
__Opposed
__Abstained



Oregon Health & Science University
Elena Andresen, interim provost
X Approved
__Opposed
__Abstained

Oregon Tech
Joanna Mott, provost
X Approved
__Opposed
__Abstained



Southern Oregon University
Susan Walsh, provost
X Approved
__Opposed
__Abstained

Western Oregon University
Rob Winningham, provost
X Approved
__Opposed
__Abstained