REQUEST FOR AUTHORIZATION TO IMPLEMENT A MASTER OF SCIENCE IN DIGITAL SUPPLY CHAIN MANAGEMENT AT UNIVERSITY OF WISCONSIN-MILWAUKEE PREPARED BY UW-MILWAUKEE

ABSTRACT

The Lubar College of Business (LCB) at the University of Wisconsin (UW)–Milwaukee proposes to establish a Master of Science (M.S.) degree in Digital Supply Chain Management (DSC). The development of the program aligns with UW-Milwaukee's mission to develop and maintain high quality graduate programs to further the professional opportunities for the diverse population served by UW-Milwaukee. It supports the strategic goal of LCB to prepare students from Wisconsin and beyond to be successful business professionals in the global economy. At the master's level, the Lubar College of Business offers an M.B.A. program and M.S. in Management programs with concentrations in Accounting, Professional Accounting, Financial Analysis, Marketing, and a standalone M.S. in Information Technology Management. The addition of an M.S. degree program in Digital Supply Chain Management will allow students to increase their business knowledge in a graduate program that is specifically designed to examine advanced topics in supply chain management and to understand how emerging digital technologies can improve the performance of supply chains. These technologies include "Internet of Things" (IoT), blockchains, sensors, digital twins, cloud architecture, enterprise resource planning, big data, and analytics. The M.S. in Digital Supply Chain Management is comprised of 30 credits and will include coursework in supply chain modeling, analytics, management, resource planning, and connected systems. Students may tailor their focus with electives in supply chain/operations management, predictive analytics, information technology management, and negotiations. The COVID-19 pandemic underscored the need for high-performing supply chains to support manufacturing, retailing, and service operations including health care. Consequently, national occupational growth is anticipated to exceed 25% over the next decade. The proposed degree addresses this demand for individuals with needed skills to support high-performing supply chains.

PROGRAM IDENTIFICATION

University Name
University of Wisconsin-Milwaukee

Title of Proposed Academic Degree Program
Digital Supply Chain Management

Degree Designation(s)

Master of Science

Mode of Delivery
Single university. The degree will be based on classes delivered in face-to-face, distance, and hybrid modalities.

Department or Functional Equivalent
The Supply Chain/Operations Management & Business Statistics Area, Lubar College of Business

College, School, or Functional Equivalent
Lubar College of Business

Proposed Date of Implementation
September 2023

Projected Enrollments and Graduates by Year Five

Table 1 represents enrollment and graduation projections for students entering the program over the next five years. By the end of Year 5, it is expected 100 students will have enrolled in the program and 65 students will have graduated from the program. The average student retention rate is projected to be 90% based on data from the past 5 years in our other M.S. offerings. Roughly 90% of these students pursued full-time study and would graduate within 1 to 2 years of admission (one year if 15 credits are taken in each semester and two years if ~9 credits are taken in each semester).

Table 1: Five-Year Academic Degree Program Enrollment Projections

Students/Year	Year 1	Year 2	Year 3	Year 4	Year 5
New Students	10	15	20	25	30
Continuing Students	-	9	14	18	22
Total Enrollment	10	24	34	43	52
Graduating Students	-	8	14	19	24

Tuition Structure

For students enrolled in the Master of Science in Digital Supply Chain Management program, standard Business Graduate tuition and fee rates will apply. For the current academic year, residential tuition, the Business Masters fee, and segregated fees total $7,456.35 per semester for a full-time student enrolled in 8 or more credits per semester. Of this amount, $6,692.00 is attributable to tuition and $764.35 is attributable to segregated fees. For Nonresident tuition, the Business Masters fee and segregated fees total $14,853.15 per semester for a full-time student enrolled in 8 or

more credits per semester. Of this amount, $14,088.80 is attributable to tuition and $764.35 is attributable to segregated fees.

If a student enrolls in courses with online delivery, the student will incur an instructional technology fee of $30 per credit for each credit of online delivery. Additionally, courses in the College of Engineering and Applied Science have a differential tuition of $21.63 per credit.

DESCRIPTION OF PROGRAM

Overview of the Program

The M.S. in Digital Supply Chain Management (DSC) is a 30-credit graduate program of the UW-Milwaukee Lubar College of Business. In the context of managing supply chains, the M.S. DSC is uniquely designed for students to explore emerging technologies (such as IoT, blockchains, sensors, digital twins, and cloud architecture), enterprise resource planning, big data, and analytics. Students will have the unique opportunity to take course work and complete projects supported by the Connected Systems Institute (CSI). CSI is a multidisciplinary center of excellence at UW-Milwaukee that facilitates education and thought leadership related to advanced industrial processes.

In a unique feature of this degree, students will have the opportunity to tailor their focus with electives in supply chain/operations management, predictive analytics, information technology management, and negotiations. Students intending to study full-time, working professionals, and international students will find the program very accessible due to its flexible offerings of on-campus, hybrid, and online classes.

Student Learning Outcomes and Program Objectives

The core objective of the M.S. DSC is to prepare students for careers in managing supply chains that are radically transforming due to advances in digital technology. Students graduating from this program will:

- Use various forms of digital technology to transform supply chains.
- Accurately describe how the effective management of digital supply chains can create value for a company.
- Apply analytics to various aspects of the supply chain process.

Program Requirements and Curriculum

Table 2 illustrates the program curriculum for the proposed program. The program requirements are comprised of 30 credits. The core course requirements are for 15 credits. There will be four 3-credit core courses on Global Supply Chain Strategies, Enterprise Resource Planning, Modeling and Analytics in Supply Chains, and Managing Connected Supply Chains. The program will also offer three 1-credit project-

based courses (Digital Supply Chain Management 1, 2 and 3), where the students will have the opportunity to work on lab projects supported by the Connected Systems Institute, visit manufacturing/service sites and/or distribution centers/retail locations, and experience other hands-on practice opportunities.

Additionally, the program will require the students to take five elective courses (3 credits each). The students will choose 2 out of 5 electives from the Supply Chain, Operations Management and Business Statistics area course offerings, which cover topics such as SAP in supply chains, Technology and Simulations in Supply Chains, Project Management and Innovative Solutions, Logistics Management and Service Operations Management. Finally, the program will offer eight additional electives (3 credits each) from various areas (Information Technology Management, Management, and Supply Chain, Operations Management and Business Statistics), where the students will choose 3 out of 8 courses.

Table 2: Master of Science in Digital Supply Chain Management Program Curriculum

Core courses required for graduation (15 credits):		
BUS MGMT 711	Global Supply Chain Strategies	3 credits
BUS MGMT 732	Enterprise Resource Planning	3 credits
BUS ADM 783	Modeling and Analytics in Supply Chains	3 credits
BUS ADM 787	Managing Connected Supply Chains*	3 credits
IND ENG 741	Foundational Technologies for Connected Systems*	1 credit
IND ENG 742	Cloud Architecture for Connected Systems*	1 credit
BUS ADM 788	Digital Supply Chain Management: Tracking and Tracing*	1 credit
Supply Chain and Operations Management Elective Courses (Choose 2 out of 5 for 6 credits)		
BUS ADM 781	Enabling Supply Chains with SAP	3 credits
BUS ADM 782	Supply Chain Technology and Simulation	3 credits
BUS ADM 785	Project Management and Innovative Operations	3 credits
BUS ADM 786	Supply Chain Logistics Management	3 credits
BUS ADM 789	Service Operations Management*	3 credits
Other Elective Courses (Choose 3 out of 8 for 9 credits)		
BUS MGMT 709	Predictive Analytics for Managers	3 credits
BUS MGMT 744	R Programming for Business Analytics	3 credits
BUS ADM 742	Big Data in Business	3 credits
BUS ADM 745	Artificial Intelligence for Business	3 credits
BUS ADM 811	Process and Work-Flow Management	3 credits
BUS ADM 812	Machine Learning for Business	3 credits
BUS MGMT 723	Managing and Negotiating Across Cultures	3 credits
BUS ADM 737	Managerial Decisions & Negotiations	3 credits

Total Credits	30 credits

Assessment of Outcomes and Objectives

The program outcomes and objectives would be assessed using both direct (exam questions, case write-ups, presentations, etc.) and indirect (graduation rates, retention rates, exit surveys, etc.) measures. Faculty teaching the courses will provide assessment data to the coordinator of the program. The results will be analyzed and presented to the program faculty and the Lubar College of Business graduate program committee to identify areas of improvement. Program faculty will develop action plans as part of the continuous improvement plan. The assessment reports will be submitted annually to the Division of Academic Affairs.

Diversity

The development of the M.S. in Digital Supply Chain Management aligns with UW-Milwaukee's mission to further the professional opportunities for the diverse population served by UW-Milwaukee and supports the strategic goal of the Lubar College to prepare students to be successful business professionals in the global economy. Consequently, the Lubar College strives to maintain diversity in all its programs. The Master of Science in Digital Supply Chain Management includes inclusive and diverse content within its curriculum. Local, regional, and international examples within specific courses help towards this objective, specifically considering the global nature of supply chains. Equity and inclusion will be central to student recruitment and student retention. Targeted scholarships will support recruitment efforts and the drive to increase diversity. Once students enroll, the Lubar College of Business has several initiatives that promote success in the overall graduate student body. A mentoring program is in place for graduate students, to ensure ready access to advice and support. Recently, LCB also expanded its tutoring efforts to cover key courses in the graduate programs to help with the retention and success of these students. Finally, LCB opened a Writing Center to ensure that graduate students have access to a writing coach, which will help with advancement and placement. All these efforts are aimed at closing the achievement gaps for student populations while enhancing the academic success of all students. Over time we expect the degree to grow in terms of admitted students. In parallel with greater numbers of participants we will need to augment our teaching faculty. Equity, diversity, and inclusion will be important considerations in hiring, given the diverse content of the program.

Collaborative Nature of the Program

The Master of Science in Digital Supply Chain Management will be primarily housed within the Lubar College of Business, except for two 1-credit courses offered from the College of Engineering and Applied Science. In addition, certain courses might use resources from the UW-Milwaukee Connected Systems Institute to complete required coursework.

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Projected Time to Degree

The M.S. in Digital Supply Chain Management can be completed within one to two years on a full- time basis. Part-time students could take longer.

Program Review

The M.S. in Digital Supply Chain Management will be subject to periodic internal and external reviews. At UW-Milwaukee graduate programs are reviewed by the Graduate Faculty Committee (GFC) on a ten-year cycle. New degree programs require a review in the fifth year of implementation. Additionally, GFC may require intermediate reviews based on the results of the regular review. Like other engineering programs at UW-Milwaukee the program review will include eight criteria: students, program educational objectives, student outcomes, continuous improvement, curriculum, faculty, facility, and institutional support. The requirements include monitoring of student progress in attaining seven outcomes, documenting processes for assessing and evaluating the extent to which student outcomes are being attained and using this evaluation for continuous improvement. Students, alumni, and employers are included in the assessment process. An industrial advisory committee is involved for each engineering program.

Accreditation

The Lubar College of Business is accredited by the Association to Advance Collegiate Schools of Business (AACSB). The M.S. DSC program will be included in this accreditation process.

JUSTIFICATION

Rationale and Relation to Mission

The proposed program responds to the following aspects of UW-Milwaukee Select Mission Statement, which can be found at https://uwm.edu/mission/:

- *To develop and maintain high quality undergraduate, graduate, and continuing education programs appropriate to a major urban doctoral university.*
- *To attract highly qualified students who demonstrate the potential for intellectual development, innovation, and leadership for their communities.*
- *To further academic and professional opportunities at all levels for women, minority, part-time, and financially or educationally disadvantaged students.*
- *To promote public service and research efforts directed toward meeting the social, economic, and cultural needs of the state of Wisconsin and its metropolitan areas.*
- *To provide educational leadership in meeting future social, cultural, and technological challenges.*

In addition, the proposed program specifically addresses the Lubar College of Business' mission which is to "stimulate innovative and analytical thinking to produce

impactful research and teaching that advance knowledge, drive change, and empower our diverse students to succeed in the global economy, thereby creating value for our students, business partners, and community."

An M.S. degree program in supply chain management which incorporates an increasing level of digital features also meets several vision attributes of the Lubar College, including being global in our outlook, relevant to our stakeholders, entrepreneurial in our approach, accessible to students from diverse backgrounds, and transformative in our impact. Our unique approach to incorporating the evolving digital aspects of supply chain management will increase the appeal of our graduates to employers in the southeast Wisconsin area, as well as to global employers headquartered both in Milwaukee and other large cities.

This program has been endorsed by the industry leaders of the Business Advisory Council of the Lubar College of Business and supply chain professionals of the Supply Chain Management Institute Advisory Council.

University Program Array

The Master of Science in Digital Supply Chain Management will be an addition to the current master's degree options within the college. Its impact will be in increased enrollment in the business College.

The degree will leverage existing curricula and faculty. However, in the future, five new courses are planned to be developed as new offerings from the Lubar College of Business and the College of Engineering and Applied Science.

Other Programs in the University of Wisconsin System

There are no M.S. programs in the greater Milwaukee region that are similar to this proposed program. The M.S. in Supply Chain Management at Marquette University, however, does offer an overview course on blockchain.

The proposed program differs from other programs offered at University of Wisconsin institutions. Specifically, the M.S. in Supply Chain Management degrees offered at UW-Madison, UW-Stout, and UW-Platteville do not include courses that cover digital supply chain technologies such as radio frequency identification (RFID), IoT, machine learning, connected systems, multi-echelon inventory optimization, blockchain, robotics, cyber-security, or real-time data analytics. The same can be said for the Supply Chain concentration within the M.B.A. degree offered at UW-Whitewater.

Need as Suggested by Current Student Demand

Supply chains worldwide are being converted from analog operation to being controlled through the analysis of digital signals from the chain itself. Doing so allows the chain to be more responsive to customer demands and be less expensive to

operate. Digital supply chains are intelligent in that they employ in sequence, sensors, data, blockchain-based data sharing, analytics, and ultimately, the use of results from analytics to manage the chain's operation and improve its efficiency. This approach to management is a special case of a broader trend in manufacturing and service operations. This broader trend, called Industry 4.0, centers around the use of data from sensors and social media to improve, through machine learning techniques, the operation of running a business from order delivery and manufacturing to customer service and market identification.

Need as Suggested by Market Demand

In the near future, all supply chain managers will need to understand how to implement such digital signaling technologies and be able to analyze the real-time streams of data generated for purposes of keeping the chain responsive to customer needs and keeping its cost down. Analysts predict strong growth in the demand for digital supply chain managers (please see the link below): (https://www.gartner.com/smarterwithgartner/gartner-predicts-the-future-of-supply-chain- technology).

In another study (please see https://www.alliedmarketresearch.com/digital-supply-chain-market), Allied Market Research reported that "*the global digital supply chain market was valued at $3.91 billion in 2020, and is expected to reach $13.67 billion by 2030, growing at a CAGR (compound annual growth rate) of 13.2% from 2021 to 2030."* The study also states that "*major growth drivers of the market include rise in demand for reliable, fast, and effective order execution; surge in need for cloud-based supply chain management solutions; and increased use of industrial-grade digital technology."*

The Bureau of Labor Standards Occupational Outlooks Handbook (https://www.bls.gov/ooh/) projects a 28% job growth nationally (much faster than average) in the period 2021-31 for logisticians who analyze and coordinate an organization's supply chain. The Wisconsin Long Term Labor Market Projections (http://wisconsinjobcenter.org/labormarketinfo/) for supply chain managers projects a 10.42% job growth in the state in the 2020-30 period.

Similar projections are made by EMSI (formerly Burning Glass) indicating a need for both general supply chain management skills as well as specific skills in connected systems, IoT, blockchain, SAP, and analytics. Within the past year, there have been nearly 4,000 unique job postings related to Logistics and Supply Chain Management. Target occupations are projected to grow over 10% through 2031 and include top companies that currently recruit our graduates, such as Johnson Controls, Rockwell Automation, Kohler, SC Johnson, and Northwestern Mutual; these are clustered heavily in the Milwaukee Metropolitan Area. Salary data for employees with graduate degrees suggest a median salary of nearly $105,000.

Finally, as we are all aware that the COVID-19 pandemic has signified the importance of effectively managing supply chains. The pandemic resulted in a big shift towards digitization of supply chains and led many customers/businesses to complete their transactions online. This shift forced many industries to increase their investments in creating intelligent, connected, and analytics-driven digital supply chains. These trends led to a greater demand for a new breed of students trained in digital supply chain management.

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