

Evolutional Roadmap from BS Degree to Doctoral Degree in Technology

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Abstract

In 2008, the School of Technology, now College of Technology (COT), launched a Master of Science (MS) in Technology degree program. The MS in Technology degree program was designed to equip students with advanced technical skills as well as leadership capabilities necessary for thriving in various technological sectors. Since 2008, the program has successfully graduated over 700 students, making significant contributions to industry and academia. The MS in Technology program offers a flexible and comprehensive curriculum that blends theoretical knowledge with practical application. The program is structured to provide a robust foundation in core technological principles along with some Leadership/Management skills, while allowing students to specialize in areas aligned with their career goals. The MS in Technology degree program started with seven (7) Primary Areas, which were later changed to four (4) concentrations based on the industry and market needs. To further address the needs of Industry, the College of Technology Graduate Studies also developed three graduate-level professional certificate programs: Six Sigma for Business and Industry, Organizational Leadership and Supervision, and Cybersecurity Post Baccalaureate Certificates.

Since 2016, Purdue University Northwest (PNW)'s strategic mission has shifted from an undergraduate teaching institution to a metropolitan doctoral-granting institution. Having over 700 MS graduates, and to contribute to the strategic goals of the institution, the COT at PNW initiated a Doctor of Technology (DTech) degree program, which was approved by the Indiana Commission for Higher Education (ICHE) on June 9, 2022. Since its inception, the DTech program has been instrumental in fostering high-level research and expertise in various technological fields. The DTech program emphasizes best practice techniques for implementation in business, industry, government, and non-governmental organizations. This doctoral program is designed for both traditional students and industry professionals seeking an advanced degree to provide innovative solutions in their fields. The Doctor of Technology program currently enrolls 6 full-time doctoral students. This paper will share the best practices and lessons learned from the evolutional roadmap from a BS degree to a doctoral degree in Technology graduate education.

1. Introduction

Purdue University Northwest (PNW) is a vibrant regional university that is part of the Purdue University system. PNW serves a diverse student population by offering over 70 undergraduate and graduate degree programs across various disciplines. PNW has earned official designation as a Hispanic-Serving Institution (HSI) by the US Department of Education (DOE) in May 2024. The College of Technology at Purdue University Northwest offers 8 undergraduate, and 3 graduate degree programs focused on preparing students for careers in various technology-driven industries. The college emphasizes hands-on learning, providing students with practical experience in addition to theoretical knowledge.

The PNW College of Technology graduate program started with a Master of Science (MS) in Technology degree program in 2008. The MS in Technology program consists of four concentration areas: Computer Information Technology, Engineering Technology, Industrial Engineering Technology, and Technology Leadership and Management. Since 2008, the program has successfully graduated over 700 students. The College of Technology also developed three Post Baccalaureate professional certificate programs: Six Sigma for Business and Industry, Organizational Leadership and Supervision, and Cybersecurity Post Baccalaureate Certificates.

The rapid advancements in artificial intelligence (AI) technologies have catapulted them into the forefront of global innovation and economic competitiveness. As the US strives to harness the potential of AI for societal, economic, and strategic advantages, the importance of cultivating a skilled and diverse AI workforce has become a critical national imperative. To meet the national need for an AI workforce, the PNW College of Technology developed a new Master of Science in Applied AI program in Fall 2023. The PNW Master of Science in Applied AI (MS in Applied AI) program was designed to equip students with the knowledge and skills to tackle a broad spectrum of challenges across diverse industries by harnessing the potential of artificial intelligence and

machine learning. The program empowers graduates to apply AI techniques creatively and responsibly to make a positive impact in their chosen fields. Purdue University Board of Trustees approved the MS in Applied AI degree for PNW on June 7, 2024. The MS in Applied AI was approved by the Indiana Commission for Higher Education on July 24, 2024, and will admit students from Spring 2025.

The mission and strategic goals of PNW are to transform students' lives and its metropolitan region through a diverse campus committed to innovative education, applied research, and community engagement. The offering of the Doctor of Technology degree will contribute to meeting the mission and strategic goals of PNW by providing innovative, affordable education and applied research opportunities for advanced-level professionals. The COT at PNW initiated a Doctor of Technology degree program and it was approved by the Indiana Commission for Higher Education on June 9, 2022. Since its inception, the DTech program has been instrumental in fostering high-level research and expertise in various technological fields. The Doctor of Technology program currently enrolls 6 full-time doctoral students.

This paper will share the best practices and lessons learned from the evolutionary roadmap from a BS degree to a doctoral degree in Technology graduate education.

2. History

Purdue University Northwest was established in 2016 through the merger of two existing Purdue University system campuses: Purdue University Calumet (Hammond campus) and Purdue University North Central (Westville campus). In 1946, both Purdue Calumet and Purdue North Central became degree-granting institutions. Over the next 70 years, these campuses grew and developed independently, serving the educational needs of Northwest Indiana. The unification of two campuses brought together the strengths of both institutions, allowing Purdue University Northwest to offer more than 70 undergraduate and graduate degree programs, balancing urban and rural settings across its two campuses and offering innovative education to students in the region and beyond.

Purdue University Calumet was established in 1946 as an extension campus of Purdue University. In 1962, it was redefined as a regional campus and renamed Purdue University Calumet Campus. In 1967, Purdue Calumet graduated its first class of baccalaureate degree students. The College of Technology is offering 8 undergraduate degree programs, and most of them are accredited by ABET. The Construction

Engineering and Management Technology (CMET), Mechanical Engineering Technology (MET), and Electrical Engineering Technology (EET) programs at Purdue University Calumet (PUC) began in 1968, with CMET and MET receiving ABET accreditation in 1972 and EET in 1976. The Bachelor of Science in Computer Information Technology (BS CIT) program started in 1974 and was accredited by ABET in 2011. The BS in Organizational Leadership and Supervision (OLS) launched in 1994 and was also accredited by ABET in 2011. The Bachelor of Science in Computer Graphics Technology (CGT) program began in 2002 and was accredited by ATMAE in 2011. The Mechatronics Engineering Technology (MTB) program started in 2008 and was ABET-accredited in 2013.

Thanks to the strong alumni base from the Engineering Technology and Information Technology programs dating back to the 1970s, the College of Technology launched a Master of Science in Technology graduate program in 2008 without adding any additional faculty or administrative resources. Initially, the M.S. in Technology program did not have any specific concentration, and the curriculum consisted of 33 credit hours (11 courses) including a 3-credit-hour required directed project course. The M.S. in Technology program had peak enrollment in 2015 with 159 registered students, which brought in both opportunities and some challenges. To overcome the limited faculty resources, the M.S. in Technology program introduced a 30-credits coursework-only option and 6 concentration areas (Zahraee and Latif 2017). This gave faculty the opportunity to define the requirement for the concentration which was printed on the student's transcript. Currently, the M.S. in Technology program has four concentrations in various disciplines in engineering technology and information technology. In addition, a fixed plan of study with Technology Leadership and Management Concentration is offered fully online.

By 2020, the College of Technology at Purdue University Northwest had graduated over 500 individuals in the Master of Science in Technology program since its inception in 2008. Many of these alumni were working in the Chicagoland and Northwest Indiana region. Purdue University Northwest is committed to innovative education, applied research, and community engagement as stated in its mission and strategic goals. The PNW strategic plan states "increase the quality and scope of collaborative, interdisciplinary research focused on real-world challenges in the surrounding community, incorporating this research into the student experience." This commitment means offering an advanced degree that includes an understanding of complex areas of mod-

ern technology. A Doctor of Technology program enables industry professionals to learn and understand extremely sophisticated concepts and problem-solving skills to optimize systems and processes, as well as prepare students to provide innovative solutions.

The College of Technology proposed a professional Doctor of Technology program, offering students the opportunity to expand and apply knowledge and research to solve practice-based problems in several technology-related fields. Graduate education in technology involves a theoretical foundation followed by practical applications through research activities, underscoring the importance of hands-on learning and real-world problem-solving (Hartman et al. 2009, 15). The Doctor of Technology program requires 90 credit hours of coursework, including 30 credits of master's level study applied toward the degree. The DTech curriculum systematically develops enhanced skills and understandings that enable professionals, already holding a master's degree or equivalent, to apply their heightened technical and conceptual understandings of technology, research, and development. The Doctor of Technology degree has two concentration areas: Engineering Technology and Computer Information Technology. Although there are several online Doctor of Technology programs in the United States, PNW on-campus doctoral program in the technology field is the only one of its kind, fostering innovation through applied research. This program will provide the opportunity for traditional students, as well as industry professionals, to pursue an advanced degree that will provide innovative solutions in their field of interest. Purdue University Board of Trustees approved the Doctor of Technology degree for PNW on Dec 3, 2021. The Doctor of Technology degree was approved by the Indiana Commission for Higher Education on June 9, 2022. Currently, there are 6 full-time Doctor of Technology students in the College of Technology.

3. Needs and Justification of the Doctor of Technology Program

The justification and rationale for the Doctor of Technology program is described in terms of institutional mission and goals, regional benefit, workforce need, faculty expertise, and program availability in the field.

4. Institutional Mission and Goals

The mission and strategic goals of Purdue University Northwest are to transform students' lives and its metropolitan region through a diverse campus committed to innovative education, applied research, and community engagement. Through a broad range of quality undergraduate, graduate, and continuing

education programs that meet regional needs, PNW seeks to advance and share knowledge through research and creative endeavor, and to work with the community to develop intellectual, cultural, economic, and human resources. The PNW strategic plan incorporates the University's mission to provide graduate study to meet the growing needs of profit and non-profit organizations in the Chicagoland and northwest Indiana region, which aligns with the Indiana Commission for Higher Education's Policy on Regional Campus Roles and Missions (Indiana Commission for Higher Education 2020). Purdue Northwest is committed to contributing to the economic wellbeing of the Region, and to preparing students to be active and responsible members of a global society and workplace. This commitment increasingly means offering post-baccalaureate study that includes an understanding of complex areas of modern technology. A Doctor of Technology program enables industry professionals to learn and understand extremely sophisticated concepts and problem-solving skills to optimize systems and processes, as well as prepare students to provide innovative solutions. The graduates of the program will be able to incorporate advanced technologies and apply them in their respective industries. This comports with the roles and missions of regional campuses designed to meet state and regional workforce needs.

The PNW strategic plan, in its mission, calls for experiential learning, faculty scholarship, and community partnerships. Goal 3 of the strategic plan states, "increase the quality and scope of collaborative, interdisciplinary research focused on real-world challenges in the surrounding community, incorporating this research into the student experience." Two of the strategies to achieve this goal are to "encourage research projects and contract opportunities which support initiatives with regional impact" and "target support with enhanced processes for increasing student-faculty research and creative collaboration." The DTech program, by serving professionals in industry, helps PNW to achieve these goals. Not only does this program address a regional need, but it also helps the regional industry with innovation, and therefore, boosts the economic development of the Region.

The program builds upon the particular strengths of Purdue University Northwest and its College of Technology, by leveraging the well-established capabilities from existing units, including Computer and Information Technology, Computer Graphics Technology, Construction Management Technology, Engineering Technology, and Technology Leadership and Management. Furthermore, other units across the PNW campus provide a rich environment for the proposed professional doctoral program. These units

include, but are not limited to, the College of Business, the College of Engineering and Sciences, and the College of Education.

Moreover, with Purdue Northwest's mission calling for responsiveness to the needs of Chicagoland and Northwest Indiana business and industry, the College of Technology is launching this practice doctorate program to aid in providing regional support to business and innovators surrounding our metropolitan university.

5. Regional Benefit

The professional doctoral degree enables students to build on the existing MS Technology degree offerings at PNW, allowing students to attain a more advanced degree and continue the path to being life-long learners. The affordability and accessibility of PNW will promote equity which is critical to our state's success. Citizens with advanced degrees earn higher salaries, enjoy accelerated career trajectories, and contribute more to local and regional economic development and prosperity. This program will help develop and unleash the potential of individuals to drive the state workforce and economy. By utilizing existing space and faculty across much of the College and University, offering the DTech at PNW will also contribute to a fuller utilization of existing resources. The Doctor of Technology is designed to encompass best practice techniques that can be implemented in business, industry, government, and NGOs, as well as by entrepreneurs, to solve complex technology-related problems. The proposed curriculum systematically develops enhanced skills and understandings that enable individuals who already hold a Master's degree or equivalent, to apply their heightened technical and conceptual understandings of technology, research, and development as they work to develop strategies to advance/enhance a PNW regional enterprise. Consequently, the Doctor of Technology will accelerate and further the careers of individuals who are already employed as they contribute to enterprise performance, efficiencies, and sustainability through contemporary applied research-based techniques. It will also increase the employability of those who are not already part of an enterprise - all students will be required to complete a dissertation focusing on applied/use-inspired research of direct relevance to professional practice.

6. Workforce Need

The need for professional doctorate degrees has been documented by Archbald who points to the fact that in addition to traditional students seeking such a degree, a professional degree such as this will also serve mid-career professionals in specific areas

like healthcare, education, information technology, and business (Archbald 2011). Because technology is rapidly changing, growth in these industries/arenas demands a higher baseline of knowledge in order to adapt to the changing environment and to stay competitive for both the individual and the business unit. Kot & Hendel concluded that "professional doctorates constitute a noticeably strong trend in the USA, UK, and Australia, and similar patterns of expansion have occurred in these three countries" (Kot and Hendel 2012). They also summarized forces contributing to the emergence of professional doctorates with a detailed analysis that can be captured in three categories: (1) Employability, (2) Growth of the knowledge economy, and (3) Government involvement and public policy. Industry has recognized the importance of the human capital and resource supply chain, particularly at the high talent/highly innovative end of the spectrum. Sperling, then director of the National Economic Council, pointed to the strengthening of skills, i.e., "investing in a skilled workforce" as one of the five pillars of a proposed National Manufacturing Strategy (Sperling 2013). Industry needs technologically capable people at the high-capability end of the human resource spectrum (Wellington and Sikes 2006). The rationale is further supported by evidence collected through three surveys of PNW College of Technology Master of Science alumni who have shown an interest in continuing their studies once this degree is offered at Purdue Northwest. Over 92% of those surveyed in November 2017, 2018, and 2019 expressed an interest in pursuing a Doctorate in Technology. Furthermore, a 2019 survey focusing on the need for and interest in a Doctor of Technology degree was sent to all MS in Technology alumni and students. This survey showed that 92.5% of respondents believe the degree is beneficial to them professionally. 76% (62) will enroll in the degree program, if offered, within the next two years.

7. Job Market Analysis and Surveys of Alumni

The following shows the data supporting the need and sustainability of the Doctor of Technology degree program at PNW. Based on data received through EMSI (Labor Market Analytics) economic modeling 2019, Q4, there were 1053 unique (5,269 total) job postings within a 150-mile radius of Hammond, IN, using doctoral or Ph.D. as a requirement or preferred requirement within the listing for the following engineering-based CIPs: 11.0103.

- Based on data received through EMSI, economic modeling 2019, Q4, there were 6,504 unique (32,800 total) job postings¹⁴ within

a 150-mile radius of Hammond, IN, using doctoral or Ph.D. as a requirement or preferred requirement within the listing for the following computer/information technology-based CIPs: 15.0303, 15.0403, 15.0612, 15.0613, 15.0702, 15.0805.

- The results of surveys gathered from attendees of the 2017, 2018, and 2019 annual Technology Graduate Program alumni receptions have shown alumni interest in and overwhelming support for a terminal degree in Technology.
- A 2019 survey focusing on the need for and interest in a Doctor of Technology degree was sent to all MS in Technology alumni and students. This survey showed that 92.5% of respondents believe the degree is beneficial to them professionally. 76% (62) will enroll in the degree program, if offered.

The College of Technology Graduate Studies at Purdue University Northwest has a Graduate Studies Advisory Council (GSAC) composed of 15 representatives, each holding a graduate degree, from regional industry as well as surrounding educational institutions. These members, based on the needs of the industries they represent, and as part of the strategic plan of the College of Technology graduate program, incorporated the offering of a Doctor of Technology as one of the goals for the graduate studies program in the College of Technology.

In summary, not only is there a regional and national need for graduates of such a degree program, but it is also clear from the survey data and the market analysis findings, that there is enough interest from our alumni and sufficient market need in the region to begin offering the Doctor of Technology degree with a large pool of qualified candidates. Sustainability will occur through those who complete the current MS in Technology at PNW, in addition to other MS programs at other regional and national institutions.

8. Faculty Expertise

The MS in Technology graduate courses are taught by the COT graduate faculty members, who are sufficient to start the Doctor of Technology program. The initial number of DTech students is not expected to be large for the current faculty to manage. However, if graduate enrollment and specifically DTech enrollment grows, appropriate part-time and/or full-time faculty will be recruited as needed. Also, to start this program, an initial commitment of funding in the sum of \$50,000 was allocated for new course development. In Addition, the Provost committed to cov-

ering tuition remission of 5 DTech students for three years. See Table 1 for faculty expertise.

9. Program Objectives, Curriculum, Courses, and the Semester Plan

The DTech from Purdue University Northwest is designed to prepare professionals to meet the needs of industry with leadership competence and advanced technology research and development skills. This doctoral program will develop leaders who are in high demand by start-ups, emerging industries, and established corporations operating in the advanced technology arena.

The core learning outcomes of the DTech program are:

1. Knowledge and Scholarship: To build the capacity to identify and conduct original research, scholarship, or creative endeavors.
2. Communication: To be able to effectively communicate their field of study
3. Critical Thinking: To think critically, creatively, and to solve problems in their field of study
4. Ethical and Responsible Research: To demonstrate the ability to conduct research in an ethical and responsible manner
5. Professional Development: To demonstrate attributes of professional development consistent with expectation within their field of study

The DTech degree program requires a total of 90 credit hours (thirty 3-credit-hour courses) to be completed, with 30 credit hours of master's level credits applicable toward the degree. For the 60-credits doctoral study, 18 credit hours are required core courses, with an additional 24 credit hours of electives and 18 credit hours of DTech dissertation research. The sample DTech plan of study for CIT and ET concentrations is shown in Tables 2 and 3.

10. Program Availability at National and Regional Levels

Nationally and regionally, there are few universities that offer Doctor of Technology degree programs. Currently, there are two similar programs within the state of Indiana: Purdue Polytechnic Institute's Doctor of Technology degree program and Indiana State University's Ph.D. in Technology Management. Both degree programs are offered as an online degree. At the national level, similar programs are offered either distance or on-campus, including:

- University of Northern Iowa, Department of

Table 1. Graduate faculty expertise in the College of Technology.

Faculty	Degree
Professor of Computer Information Technology	Ph.D., Engineering Science
Professor of Civil Engineering	Ph.D., Civil Engineering
Professor of Computer Graphics Technology	Ph.D., Technology
Professor of Organizational Leadership and Supervision	Juris Doctor
Professor of Electrical Engineering Technology	Ph.D., Electrical Engineering
Professor of Computer Information Technology	Ph.D., Biomedical Engineering
Professor of Computer Information Technology and Graphics	D.Sc., Computer Science
Associate Professor of Electrical and Computer Engineering Technology	Ph.D., Electrical Engineering
Professor of Computer Information Technology	Ph.D., Telecommunications and Networking
Professor of Electrical Engineering Technology	Ph.D., Industrial Technology
Associate Professor of Computer Information Technology	Ph.D., Computer and Electrical Engineering
Professor of Mechanical Engineering Technology	Ph.D., Chemical Engineering/Corrosion Science
Associate Professor of Mechatronics Engineering Technology	Ph.D. Computer Information System Engineering
Associate Professor of Computer Information Technology	Ph.D., Electrical Engineering
Professor of Computer Information Technology	Ph.D., Computer Science
Associate Professor of Industrial Engineering Technology	Ph.D., Technology Management
Assistant Professor of Construction Engineering and Management Technology	Ph.D., Civil/Structural Engineering
Assistant Professor of Construction Engineering and Management Technology	Ph.D., Civil, Environmental and Sustainable Engineering
Assistant Professor of Mechatronics Engineering Technology	Ph.D., Sustainable Energy Systems Engineering
Assistant Professor of Cybersecurity	Ph.D. in Engineering and Applied Science
Professor of Mechanical Engineering Technology	Ph.D., Engineering Mechanics

Technology, offering a Doctor of Industrial Technology.

- Texas A&M University (TAMU) has a D. Engineering program in its College of Engineering with a different focus.
- Capella University and Walden University both offer a Doctor of Information Technology, a fully online program, as opposed to this program, which is on-campus.

11. Sustaining the College of Technology Graduate Programs

To sustain the quality of the program, a continuous feedback mechanism and assessment are in place. A survey of program alumni from 2020 to 2024 shows that the outcomes and goals of the program were met (Figure 1). Detailed assessments of this program are described in two papers by Zahraee, Latif, and Colwell (Latif, N., Zahraee, M.A., Colwell, J.

2013) (Latif, Zahraee, and Colwell 2013; Latif and Colwell 2014). A similar data collection of alumni in 2016 showed that many of them were hired by regional companies, resulting in the program having a positive impact on the economic development of the region.

To sustain the growth of the program and have a stronger alumni base, an annual alumni event was introduced in 2015 and continued until 2019. The alumni event was paused due to COVID-19, and we are planning to resume the alumni event. Alumni from the MS in Technology program were invited from all over the country and were updated on the progress of the program. This program is a fun homecoming event to introduce some of our existing graduating students to our alumni and create an atmosphere of camaraderie among our graduates. Alumni were also surveyed at these events to measure the support for the creation of a new Doctor of Technology program (Table 4).

12. Assessment and Quality Assurance

Due to the large number of students who enroll and graduate every year (Figure 2), to maintain the enrollment numbers, a large pool of applicants is needed. Having a robust and comprehensive marketing plan is the most critical challenge posed to a successful, growing degree. It requires both effort and financial resources. The program decided to run the fully on-line master's program through the office of Academic Outreach and Contract Training (AOCT).

While marketing the program to attract a large number of applicants is a major task, the needs of constituents and keeping the program up to date should never be forgotten. Each academic year, the COT graduate coordinator and the associate dean will collect required graduate course assessment data from the faculty member who taught graduate courses in that academic year. The threshold level for each Performance Indicator (PI) is indicated on the associated tab. Generally, if the percentage of students' score is less than 80% on a PI, attention is needed. Each of the five COT graduate learning outcomes is tabulated

Table 2. PNW Doctor of Technology Plan of Study for CIT Concentration.

	Course Number	Course Title	Semester Offered	Credits
From Master's Degree				30
Core Courses 18 - Cr.	IT 57100	Project Management in Industry and Technology	F	3
	OLS 58900	Leadership and Ethics	F	3
	MET 52700	Technology from a Global Perspective	F	3
	ITS 53100	High Performance Computing and Big Data	Sp	3
	TECH 62110	Enterprise System Design	Sp	3
	TECH 64600	Analysis of Research in Industry & Technology	F, Sp	3
Electives 24 - Cr.	TECH 6XXXX	Industry 4.0	F, Sp	3
	ITS 66600	Advanced Visualization Techniques	F, Sp	3
	ITS 6XXXX	Advanced Topics in Cybersecurity	F, Sp	3
	ITS 62000	Cybersecurity and Machine Learning	F, Sp	3
		Free 50000/60000 level Technology Electives	F, Sp	3
		Free 50000/60000 level Technology Electives	F, Sp	3
	TECH 58100	Workshop in Technology	F, Sp	3
	TECH 62110	Seminar in Technology/CIT	F, Sp	3
Dissertation 18 - Cr.	TECH 64010	Research DTech Thesis	F, Sp, Su*	**
	TECH 64010	Research DTech Thesis	F, Sp, Su*	**
	TECH 64010	Research DTech Thesis	F, Sp, Su*	**
	TECH 64010	Research DTech Thesis	F, Sp, Su*	**
	TECH 64010	Research DTech Thesis	F, Sp, Su*	**
	TECH 64010	Research DTech Thesis	F, Sp, Su*	**
Total Credits				90

* Summer session available only if Major Professor has another course on the summer schedule.

** TECH 64010 is a variable credit course usually scheduled for 3 credit hours; however, it may be taken for more or less than 3 credit hours. Major Advisor approval required.

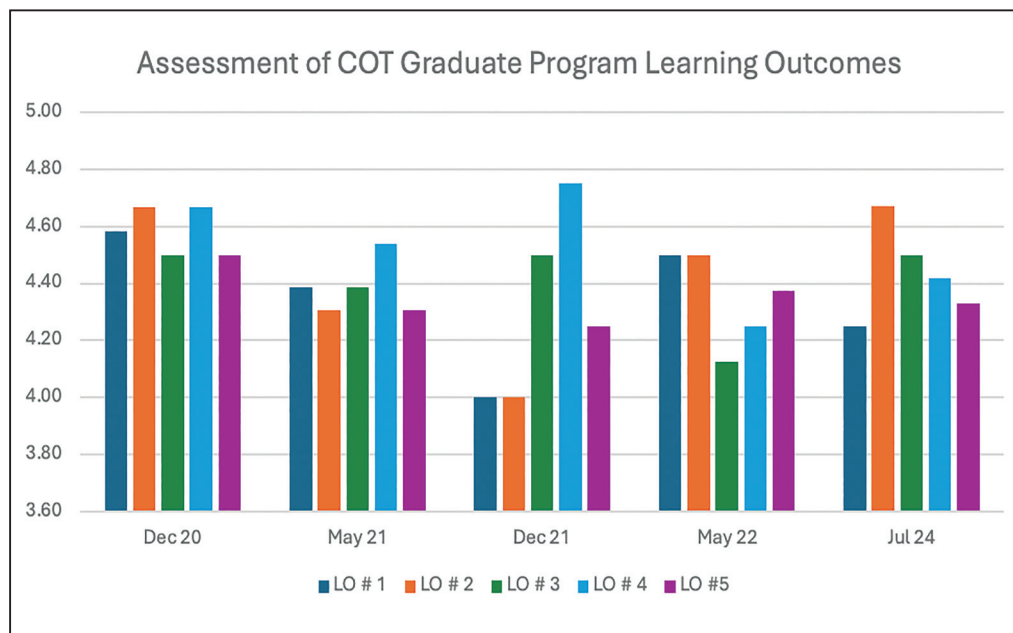


Figure 1. 2020-2024 College of Technology graduate student exit survey. July 2024 survey includes alumni from 2023 and 2024.

Table 3. PNW Doctor of Technology Plan of Study for ET Concentration.

	Course Number	Course Title	Semester Offered	Credits
From Master's Degree				30
Core Courses 18 - Cr.	IT 57100	Project Management in Industry and Technology	F	3
	OLS 58900	Leadership and Ethics	F	3
	MET 52700	Technology from a Global Perspective	F	3
	ITS 53100	High Performance Computing and Big Data	Sp	3
	TECH 62110	Enterprise System Design	Sp	3
	TECH 64600	Analysis of Research in Industry & Technology	F, Sp	3
Electives 24 - Cr.	TECH 6XXXX	Industry 4.0	F, Sp	3
	TECH 62510	Risk Analysis and Management	F, Sp	3
	TECH 6XXXX	Enterprise Planning	F, Sp	3
	STAT 6XXXX	Advanced Statistics	F, Sp	3
		Free 50000/60000 level Technology Electives	F, Sp	3
		Free 50000/60000 level Technology Electives	F, Sp	3
	TECH 58100	Workshop in Technology	F, Sp	3
	TECH 62110	Seminar in Technology/ET	F, Sp	3
Dissertation 18 - Cr.	TECH 64010	Research DTech Thesis	F, Sp, Su*	**
	TECH 64010	Research DTech Thesis	F, Sp, Su*	**
	TECH 64010	Research DTech Thesis	F, Sp, Su*	**
	TECH 64010	Research DTech Thesis	F, Sp, Su*	**
	TECH 64010	Research DTech Thesis	F, Sp, Su*	**
	TECH 64010	Research DTech Thesis	F, Sp, Su*	**
Total Credits				90

Table 4. Alumni Support by Major to Survey Question: Doctor of Technology.

Program	2017	2018	2019
Computer Information Technology	4	1	1
Electrical Engineering Technology	2	0	0
Industrial Engineering Technology	4	3	2
Mechanical Engineering Technology	1	1	1
Mechatronics Engineering Technology	0	1	1
Technology Leadership Management	5	4	2
Total	16	10	7

with associated courses, performance indicators, specific assessment methods, performance indicator targets, and actual assessment data. Table 5 shows the IT50700 course assessment outcome. Based on the assessment results, the course instructor will provide a continuous improvement plan for each academic year (Table 6).

13. Conclusion

The College of Technology at Purdue Univer-

sity Northwest started to offer B.S. degrees in Mechanical, Electrical and Construction Engineering Technologies in 1968. Most of the B.S. degree programs in the College of Technology are accredited by the ABET. With the strong alumni base, the College of Technology launched a Master of Science in Technology graduate program in 2008 without adding any additional faculty or administrative resources. Currently, the M.S. in Technology program has four concentrations in various disciplines in engineering technology and information technology. The Master of Science in Technology program has graduated more than 700 students since its inception in 2008. Many of these alumni were

working in Chicago, South Chicago, and Northwest Indiana.

With the success of the Master of Science in Technology graduate program, the College of Technology proposed a professional Doctor of Technology program, offering students the opportunity to expand and apply knowledge and research to solve practice-based problems in several technology-related fields. The DTech curriculum systematically develops enhanced skills and understandings that enable professionals, already holding a master's degree or equivalent, to apply their heightened technical and conceptual understandings of technology, research, and development. This program provides the opportunity for traditional students, as well as industry professionals, to pursue an advanced degree that will provide innovative solutions in their field of interest. Currently, there are 6 full-time Doctor of Technology students in the College of Technology.

This paper focused on the development of the Doctor of Technology program with regards to institutional mission and goals, regional benefit, workforce need, faculty expertise, and program availability in the field. In addition, the paper describes the approaches taken to sustain the COT graduate

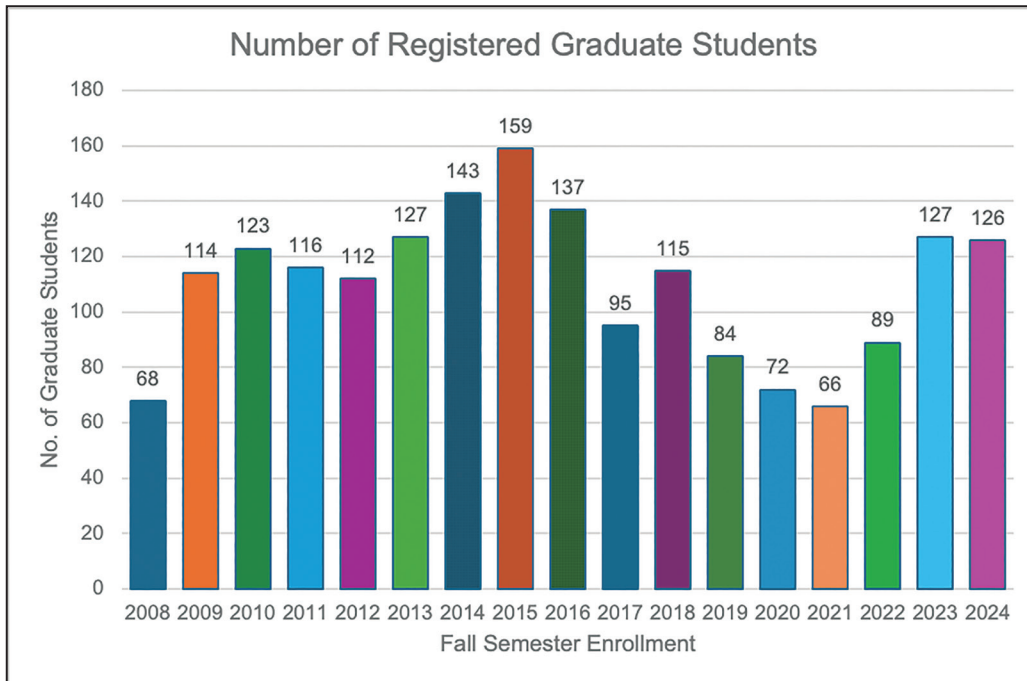


Figure 2. Number of College of Technology graduate students from 2008 to 2024.

Table 5. Spring 2024 IT50700 course assessment outcomes.

Course Objective	Supported Purdue Student Outcomes	Assessment Tool 1	Score (%)	Assessment Tool 2	Score (%)	Assessment Tool 3	Score (%)	Assessment Tool 4	Score (%)	Excellent	Good	Average	Poor	Very poor	Composite
1. Describe and display data appropriately.	1, 2, 3, 5	A 1	98%	Midterm exam	79%					12	3				4.80
2. Apply rules of probability.	1, 2, 3	A 2	89%	A 3	95%	A 4	90%	Midterm exam	84%	12	3				4.80
3. Explain random variable and sampling distributions.	1, 2, 3	A 5	94%	Midterm exam	84%					11	3	1			4.67
4. Apply hypothesis testing and regression analysis.	1, 2, 3, 5	A 7	81%	A 8	81%	A 9	67%	A 10	75%	11	4				4.73
5. Compare populations' parameters. 1, 2, 3 Assignment 8 81% 9.00 5.00 1.00 4.53	1, 2, 3	A 8	81%							9	5	1			4.53
6. Communicate statistical concepts and applications.	1, 2, 3, 5	Term paper	94%	Midterm exam	84%					10	5				4.67

Table 6. Spring 2024 IT50700 course assessment outcomes.

IT 50700 - Measurement and Evaluation in Industry and Technology			
Date Implemented	Impetus for change	Action & Impact	By whom
Spring 2024	Updating group project	Student groups given databases such as the government's Open Data to formulate a research question for their term papers.	Instructor
Fall 2023	Updating group project	Student groups prepared a recorded lecture on an assigned topic.	Instructor
Spring 2022	Clarification	To promote conceptual understanding, more hand calculation examples were used.	Instructor
Spring 2021	Statistical concepts	Prepare a lecture on P-value and Chi-square.	Instructor

programs, and the assessment and quality assurance methods adopted by the COT graduate programs.

Few lessons have been learned throughout the evolution of the COT graduate programs. A step-by-step approach in growth, by slowly expanding the program, will help the program flourish as the offering becomes broader and therefore addresses the needs of a broader constituency. The College of Technology at Purdue University Northwest understood that enrollment would increase as students find employment or see advancement in their current position. It took advantage of the faculty's industrial contacts to provide internships to its students to increase their employability. This helped the reputation of the program as more and more students applied for the program. Some innovative approaches are needed to provide a sound financial strength for the graduate programs. This helps with marketing the program and having a large pool of applicants. The graduate program decided to run its online program through the office of AOCT, which allows revenue generation for the program. This enabled the program to provide assistantships, as well as have financial resources for further marketing the program. As the growth occurs, the program should continuously assess the needs of its constituencies to ensure an up-to-date curriculum, addressing those needs.

Reference

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