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The Doctoral Program of Management in Information Technology at Six

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Abstract: Experience with the Doctor of Management in Information Technology (DMIT), offered in the College of Management, Lawrence Technological University in the six years since 2002 is described. The mission of the program is to offer doctoral level education for working professionals with high levels of managerial and IT expertise. With a number of students passing through the research phase of the program the focus on innovation within enterprises has become a priority, as well as on IT leadership, based on state-of-the-art knowledge of ITs. The paper describes the approach to outcomes assessment in terms of defined criteria. Some operating results are presented, including data on student performance. Lessons learned during six years of offering the DMIT have impacted a number of aspects of the program, such as offering hybrid modes of delivery for some courses made possible by new education technologies, continuous updating of course syllabi to reflect the latest ideas and practices in consultation with the DMIT Advisory Board, modified approaches to preparing students for the comprehensive examinations, standardizing the research process, refinements in faculty approaches to supervising the dissertation research projects, and improved program governance. The program has enhanced the quality of faculty scholarship in the College of Management, and is attractive for LTU adjunct faculty, graduate students and alumni who are interested in pursuing doctoral studies. The research agenda and completed research topics are included in the paper.

Keywords: Doctoral program, information technology education, information technology management, curriculum, dissertation research, outcomes assessment

EDSIG activities include the publication of ISEDJ and JISAR, the organization and execution of the annual ISECON and CONISAR conferences held each fall, the publication of the Journal of Information Systems Education (JISE), and the designation and honoring of an IS Educator of the Year. • The Foundation for Information Technology Education has been the key sponsor of ISECON over the years. • The Association for Information Technology Professionals (AITP) provides the corporate umbrella under which EDSIG operates.

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Abstract

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1. INTRODUCTION

The Doctor of Management in Information Technology (DMIT) was implemented in the College of Management (COM) at Lawrence Technological University (LTU) in 2002. The design of the program is described by Steenkamp and DeGennaro (2003) and was presented at the ISECON 2003 Conference. The program has enrolled seven cohorts totaling 57 students, and has graduated 16 students. In this period a number of changes in the business environment have challenged academia in general, and the DMIT is particular. Some of the changes created opportunities for certain programs while requiring others to revise or even redesign curricula and pedagogy. At the same time advancements in information technology (IT) has

continued at a rapid rate, offering opportunities for innovation while challenging businesses to remain competitive. In 1999 Butler (1999) wrote about the E-era of innovation, and Carlson and Wilmot (2006) have emphasized the fact that innovation is the process of creating and delivering new customer value in the marketplace. The DMIT views innovation as a key measure of contribution of a dissertation and candidates are challenged to propose and demonstrate innovative solutions to enterprise problems.

Businesses of all sizes have become increasingly globalized, meaning that transactions are conducted in the global marketplace, and there is a global supply chain involved in serving business clients and customers. An unprecedented number of mergers, acquisi-

tions and take-overs have occurred in the early years of this century challenging companies to redesign, reengineer their business processes or otherwise improve their business strategies. Many companies in Southeast Michigan have down-sized by way of outsourcing and off-shoring some business processes and IT development projects in attempts to restore their financial health and remain in business. These events have had a profound impact on the workforce as a large number of employees have difficulty landing new jobs.

While the mentioned business phenomena have been occurring E-Business and E-commerce have become more entrenched. Internet-based computing in the public and private sectors has become ever more attractive with fast broadband technologies, improved infrastructure with better security, and ease of use. Web-based products and services have become a trend as mobile devices are integrated in the IT infrastructure (Bosch, 2007). Among the many advances are the rise of social networking, net-marketplaces, virtual collaboration in global projects and conferences, all made possible by the availability of the Internet (Mikroyannidis, 2007). Not only have these advances changed the way enterprises do business and communicate with their constituents, also profoundly influenced Education institutions at all levels with new versions of learning systems providing features such as virtualization, synchronous communication through collaborative education technologies, and content management systems.

Steenkamp and DeGennaro (2004) wrote that "organizations have become increasingly dependent on IT systems while striving to add value, streamline business processes and maximize their competitive advantage. In most successful enterprises today business processes are carried out, or are supported by IT-based systems …". Also, "IT is regarded by many to be the key enabler for an enterprise to differentiate itself from the competition". These observations apply equally today, and IT systems remain the backbone of enterprises in the developed world, but there has been a major change in how IT services are made available. As in the nineties organizations are reconsidering their dependence and utilization of IT, and the skills and competencies of the IT staff whom they recruit.

During the period when the Internet bubble burst Denning (2001) wrote about the need for educators to focus on the requirements of a changing and advancing IT workplace. In an entertaining article Grier (2007) declared that "Our educational system does little to prepare computer science students for making the transition to the working world".

Freeman et al. (2000) have lamented the imbalance in the supply and demand of information systems doctorates. They stated their belief that "the temporal nature of the imbalance is structural, persistent and not a short-term anomaly". In Michigan the general fields of business and management offer some doctoral programs with some specialization options in information systems and information technology (IT). There are a few Ph.D. programs in Technology, Computer Science, Information and Information Systems requiring full-time study. However, there are very few doctoral programs in IT, and only one in management of IT.

In the current business climate professionals with specific IT skills needed by companies, coupled with a sound understanding of business processes find well-paid positions in industry. As a result IT professionals are reluctant to study full-time, preferring other options such as online programs. There is, however, a noticeable interest in doctoral studies arising from business and IT professionals in mid-career who are retrenched or take early retirement packages.

This paper reviews the approach to outcomes assessment (OA) and lessons learned in the program since 2002. The program continues to serve working professionals with an advanced learning experience focused on the integration of IT into business and industrial processes. Updates on the program in terms of the curriculum, operating results, and lessons learned are offered.

2. APPROACH TO OUTCOMES ASSESSMENT

OA is a defined process at LTU for all study programs, conducted at the end of each academic year as required by the university and College of Management accrediting bodies (Castelli and Green, 2006). Appendix 1 shows assessment criteria grouped into University Infrastructure, College Infrastruc-

ture, Program Infrastructure, and Program Outcomes that have informed the thinking as the program was grown to the present state. In the DMIT the approach is to review the mission of the program in terms of the COM and university missions, and the goals and strategies of the program in terms of those of the COM (refer Appendix 2). The matrix, shown in Appendix 3, used for OA has the following columns, reflecting the assessment criteria:

- DMIT Outcome *(State if Program Outcome [PO] / Student Learning Outcome [SLO] / Effectiveness Measure [EM])*

- Desired Outcome/Result *(Cite Measurable Criteria for Success)*

- Means of Assessment *(Evaluation Tool)*

- Actual Outcome/Result *(Cite Data Findings)*

- Use of Results *(Strategies to Improve or Continue Success)*

The approach requires that each course in the DMIT be assessed in terms of these assessment criteria enabling faculty to align their courses with the program. Each course must also consider how the actual outcome results are used to continue success or improve the course. The program goals and strategies, objectives, and aspects such as delivery mode and pedagogy have received attention over the life of the DMIT. Appendices 2 and 3 present assessment data since 2003.

3. DMIT CURRICULUM

The original design of the DMIT curriculum has met with the approval of constituents, including graduates, the DMIT Advisory Board and current doctoral students. Student feedback, gathered from the Noel-Levitz Survey every second year, has indicated a high level of satisfaction (90 percentile) with the program. Noel-Levitz, however, addresses criteria that the colleges and faculty cannot control (such as computers and parking), as well as factors that can be controlled (such as advising). A new survey will be conducted in 2008, which relates directly to the faculty and student engagement and is better suited to evaluate student satisfaction at the academic level.

The mission of the program remains to serve working professionals with high levels of managerial and technical expertise in IT with doctoral level education. The intent is to provide advanced learning experiences focused on leadership through the integration of IT into business and industrial processes to attain higher levels of quality and efficiencies. This is aligned with the Baldrige concept of learning transformation (NIST, 2008), defined as the process of converting theory into actionable IT management skills applicable, immediately or in the near future, into students' working environments.

With a number of students passing through the research phase of the program the focus on innovation within enterprises has become a priority, as well as on IT leadership, based on state-of-the-art IT knowledge.

The DMIT goals and strategies have been updated as follows:

1) Offer learning experiences focused on problem-solving, leadership and innovation.

2) Enhance learning transformation by applying theory to attain actionable IT management competencies.

3) Cultivate innovation through applied research.

4) Share research results with academic. peers via peer reviewed journals and conferences.

5) Be informed of best practices to improve quality and efficiency in business and IT processes.

6) Foster collaboration with industry and commercial sectors.

Based on the feedback from constituents, the curriculum continues to comprise of coursework and problem-oriented research towards a dissertation to find innovative solutions to complex, interdisciplinary challenges in industrial and/or business settings.

The six thematic areas of scholarship and practice that were defined in the original design of the program remain, namely:

1) Abstraction and modeling – understanding/ representing of problem space.

2) Process – corresponding to knowledge of real-world best practices.

3) Optimization – improvement of IT and software processes, activities and tasks.

4) Quality – IT and software product and process assurance.

5) Measurement – management of process and product by means of metrics.

6) Manufacture – software construction focusing on reuse.

In order to provide the context of the DMIT curriculum some key definitions are given here. We view an IT system as encompassing all the software, hardware and infrastructure resources forming part of the system, designed to add value to the business processes of the enterprise. The body of knowledge of IT is evolving continuously as new research ideas, and their application in enterprises, become main stream. For example, wireless and mobile computing, web-based computing and related security issues, and integration of former disparate functions, have had significant impacts on business processes. New approaches to software acquisition, including utilizing Internet technologies, and ways of collaboration among stakeholders are adding value to business and industrial processes, in turn are aimed at optimizing the functioning of the enterprise at all levels.
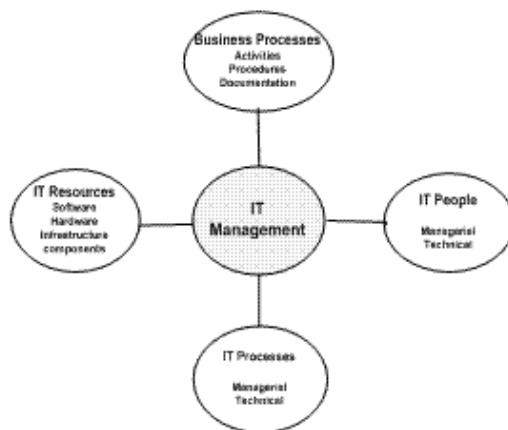
Figure 1. IT Management

IT Management is depicted in Figure 1 as a central function, performed by IT people, utilizing IT resources by means of IT processes, in support of the business processes of a contemporary computer-based enterprise.

The DMIT curriculum consist of two parts: 1). Coursework providing state-of-the-art knowledge in key subfields of IT management, as well as comprehensive coverage of quantitative methods and supporting disciplines; and 2) Research focused on developing innovative solutions to real-world problems. A typical schedule is provided in Appendix 5. The updates to the curriculum are highlighted in the following sub-sections.

Coursework

As stated on the DMIT portal the coursework builds on a foundation in database technology, software development methodologies and technologies, system architecture, and telecommunication and networks, along with project management and the principles of business, that prepare the new doctoral student for DMIT studies. The three coursework tracks namely the Major, Research Methods and Minor tracks have remained unchanged, while the courses were updated based on feedback and experience gained over time. The coursework phase must be completed before a student can register for the dissertation phase of the program.

IT Major track: The five courses in this track address the key subjects in IT Management. Subject matter experts and established authors have participated in the Major Track helping to keep the coverage current.

IT Life Cycle Processes are concerned with the processes by which IT resources are acquired, maintained, supported, managed and aligned with the business processes of the enterprise. Frameworks, standards and reference models for structuring the IT process architecture, within the context of business value chains, are studied. Individual and team project assignments have been extended to address situations in real world environments. Text, such as Harmon (2007) and Steffen and Narayan (2007), provide approaches for business process modeling and full life-cycle support for end-to-end processes. Steenkamp and Van (2004) have described a case study of the approach followed in this course. The modeling tools of Metastorm's Provision are used extensively in this course.

Advanced Data Management. The course has been updated with the latest theory and practice of object-orientation, service orientation, data warehousing, data mining, and on-line-analytical processing. New approaches to create and access integrated data repositories, such as using an Internet-based enterprise portal, are explored in the applied context. The course covers the object data standard, advanced database normalization processes, mapping rules for mapping data models to database schemas, and multidimensional data models. Students are given the opportunity to apply data cube technologies, ETL (Extraction, Transformation, and Loading) methods in collecting and integrating data from various data sources to a database for data warehousing, patterns and pattern analysis (Chang, 2003a; Chang, 2003b; Chang, 2004a; Chang, 2004b; Chang2004c; Chang, 2005).

IT Leadership and Management. Here the focus is on the skills needed to lead and manage today's IT-based organizations in a changing world. Organizations, whether private, public, profit or non-profit, conduct business in national and global contexts requiring the ability to exchange information, provide and use services, and communicate through state-of-the-art ITs (McCord and Boone, 2007). Managers at all levels must be aware and versed with the potential of existing and emerging ITs to provide leadership, and manage the affairs of the enterprise. Key skills required fall into the areas of strategic and tactical planning, budgeting and finance, IT management, and human resources. Key issues include the alignment of IT initiatives with business goals and objectives, simultaneous management of operational and development environments, and the determination of the impact of new business organization models on IT infrastructure and services (McCord, 2003). Leadership in the global business environment is emphasized and aligned with the COM goals (refer Appendix 2). This course has been hybridized (refer mode of Delivery and Pedagogy below).

IT Systems Architecture is concerned with the software, hardware and infrastructure assets of the enterprise architecture. A meta architecture framework has been developed to analyze the requirements of views of architecture viewpoints in the architecture stage. The course is informed by a number of architecture frameworks and approaches used in practice, including TOGAF 8.1.1. The program has membership in the Architecture Forum of The Open Group, and a number of contributions have been made at national and international conferences hosted by this body (Steenkamp and Li, 2006; Li and Steenkamp, 2006; Nnolim and Steenkamp, 2007; Steenkamp et al., 2008). The architecture approach followed in team projects in this course has been documented in a number of papers written in collaboration with DMIT students, with presentations at ICIER international conferences (Steenkamp and Kakish, 2004; Steenkamp et al., 2004a; Steenkamp et al., 2004b; Steenkamp et al., 2004c) and ISECON national conferences (Steenkamp et al., 2005; Steenkamp et al., 2006a; Steenkamp et al., 2006b) and ISO-neWorld (Nnolim and Steenkamp, 2007). The papers describe case studies focused on various architecture viewpoints, based on team projects that were sponsored by industry. A range of computer-based tools are used by students to develop and document the models. Students are informed by international standards, reflecting best practices. Team project deliverables are stored in a Sharepoint Repository which provides read-only access to future classes.

Advanced Topics in IT. Several instances of this course have been offered allowing the program to focus on emerging ITs that represent leading edge opportunities for an enterprise, on ITs that have become a trend, or on best practices in Europe. An offering of this type of course explores one topic in depth. Typical course topics are:

- *Re-usable component software technologies*, based on the object-oriented architecture, dealing with reference models, frameworks, patterns, process models, methodologies and notations for agile application development.

- *IT Metrics and ROI*, dealing with issues concerning predicting, documenting and evaluating the return on IT investments. IT leaders are required to rigorously document the performance of their organizations in delivering high quality, cost-effective services to the organization, as mandated by models such as CMMI and Six Sigma.

- *Sourcing IT Services*, dealing with the management of external service rela-

tionships. Outsourcing relationships comprise an important part of the IT manager's responsibility, and require a different set of skills than those used to manage in-house IT organizations, such as the assessment of the potential for outsourcing, preparing the IT organization for an outsourcing project, developing outsourcing agreements, managing the implementation of outsourcing contracts, and integrating outsourcing solutions with in-house services.

• *IT Security Management*. The security of all assets of the contemporary organization must be assured through an IT Security Management System (ITMS) as authorized by a strategic decision. The organization should develop, implement, maintain and continually improve a documented ITMS within the context of the organization's overall business risks. In the Internet era enterprises are increasingly vulnerable to breaches in security and unauthorized use of organizational assets. In addition the malicious damage and destruction of the IT electronic and physical infrastructure have become real threats. This course provides a managerial perspective of the field of IT security based on ISO/IEC and IEEE standards.

• *Knowledge Management*, dealing with the management of corporate knowledge assets. It is widely acknowledged that, in order to harness knowledge of an enterprise, a KM system is needed, i.e. a system which creates, preserves and utilizes the intellectual assets (Steenkamp and Konda, 2003; Konda and Steenkamp, 2004). Due to the diversity of knowledge assets and the challenges of utilizing them in support of the strategic goals of an enterprise, an enterprise knowledge framework is needed. Within such a framework a KM system may be built using a KM process architecture, a process/IT alignment matrix, a KM methodology, and a KM system architecture.

Research Methods track: The courses in this track focus on quantitative and qualitative methods relevant to research in the field of IT Management.

IT Research Methodology studies scientific methods of research, including empirical and qualitative approaches, modeling approaches and taxonomies. Aspects such as proposal formulation, methods of investigation, demonstration of concept, approaches to research validation, and documenting research results are addressed. The course is team-taught, as described by Steenkamp and McCord (2007), in the form of a series of seminars with the final seminar conducted by the students.

Quantitative Methods I deals with the application of quantitative techniques to manage, manipulate and interpret quantitative and qualitative data and information in business and IT environments; the course is supported with appropriate tools.

Quantitative Methods II studies deterministic and stochastic analytical techniques and tools that can be used to optimize decision-making in the pursuit of meeting organizational goals, such as cost efficiency, service delivery and profitability.

Modeling and Simulation develop and enhance problem-solving and decision-making capabilities in an IT and enterprise environment. The behavior of complex systems is analyzed using various research approaches including application of systems theory and supporting computer-based tools. Complex IT systems require various types of descriptive, prescriptive and predictive models to depict their static structure and simulation to analyze the dynamic behavior. Operational specifications allow these models to simulate business scenarios and to be used to prototype optimized solutions (Andreescu,

Minor track. Courses in this track are graduate level electives, serving to complement the cognate area of a student's research interest. The field of IT has interdisciplinary relationships with many other fields of business, management, science and engineering.

Comprehensive Examinations

On completing the coursework in the Major and Research Methods tracks, qualifying students are eligible to write the comprehensive examinations (C.E.) in February and/or August on successive Saturdays. These examinations are based on a case study, made available three days before the examination date. At the time of writing 41

students have passed the C.E. and gained doctoral candidacy.

Dissertation Research

In accordance with the LTU mission and the goal of the DMIT the research phase of the

DMIT curriculum is focused on applied research towards an innovative solution using existing or new bodies of knowledge. The doctoral student should identify a problem situated in a real-world environment, with potential for an innovative IT-based solution. A number of partnerships with enterprises have been established during doctoral research projects. Each of these projects are conducted based on a proposal which outlines the problem to be investigated, the scope of the project, research strategy and process, and estimated project schedule (this is prepared during DIS8013). The proposal should also include a preliminary review of the literature on the research focal and background theories and their applications. Applied research topics are typically drawn from problems in practice, and research is undertaken in partnership with the sponsoring enterprise, according to agreements of collaboration. Research is lead by the dissertation supervisor supported by a dissertation committee, which includes one or more key stakeholders in the sponsoring enterprise. The Doctoral Dissertation Research Prospectus (LTU, 2006a) provides guidelines for conducting dissertation research, including an overview of doctoral research norms and the characteristics of an LTU dissertation, guidelines regarding LTU standards for dissertation content, such as form and style, a reference table of the LTU-preferred style and the APA style, and some style examples. Guidelines and procedures about obtaining authorization from the Institutional Review Board to conduct a survey and /or interviews are also included. Generic information about the steps in the research phase are provided in the prospectus, policies and procedures related to the research project, the naming of the dissertation committee, and other relevant aspects . The Dissertation Template (LTU, 2006b) provides a standard format for the dissertation, and the Doctoral Research Brochure (LTU, 2008) gives directives about publication requirements for the dissertation, processing for UMI/Proquest submission, and binding. The intellectual property rights of faculty and

students appear in the LTU IPR Document (LTU, 2006c). Research approaches in the DMIT are described by Steenkamp and McCord (2007) and Chang (2007).

Students are required to submit a peer reviewed article, or at least such an article ready for submission, along with the final dissertation at the time of the dissertation defense. A complete list of articles produced as part of the DMIT research agenda is available on request.

Mode of Delivery and Pedagogy

While all courses were originally taught on-ground over weekends, some coursework have been adapted to the hybrid mode of delivery, meaning interleaving of on-ground and online sessions, supported by synchronous communication tools such as WIMBA. Hybrid deliveries allow more flexibility for faculty and students with busy traveling schedules but have their own challenges. An added benefit with the current gasoline prices is that commuting expenses to attend class are reduced by 50%. Pedagogy involves a multi-faceted approach, with faculty lecture sessions, guest lectures, student presentations, discussion forums, and team projects. A recent approach is to store PDF copies of team project binders in Sharepoint, allowing read-only access for future classes. All courses are supported by the Blackboard Learning System, which facilitates faculty-student, and student-student collaboration. A comprehensive set of international standards in the sub-fields of IT are accessible online. The LTU reference librarians provide excellent support for the DMIT by assisting students in their literature reviews, and to obtain books, articles and dissertations from digital databases.

Student performance evaluations are collected according to faculty preference, and are typically based on course participation, assignment deliverables, and presentations using evaluation instruments such as:

- Individual assignments
- Blackboard participation
- Class participation
- Team project assignments
- Presentations
- Examinations

- Peer based performance evaluation

4. OPERATING RESULTS

During the six years since starting the DMIT the policies, processes and procedures, the process improvement approach, program and curriculum descriptions, rubrics, general forms, letters and templates, and research support have been documented as summarized in Table 1. The DMIT Handbook contains the general policy, guidelines and rules governing the program. The essential information about the program, forms related to the application process, achievements by students and Faculty appear on the DMIT portal.

DMIT Policies, Processes and Procedures
DMIT Handbook
Applications Process
Admissions Process
Advising Process
Diagnostic Evaluation Interview Process
Orientation Process
Coursework Administration Process
Comprehensive Examinations
Intellectual Property Policy
Research and Scholarship Guidelines
Research Partnerships
Graduation Procedures
Process Improvement Approach
Program Outcomes Assessment Process
Outcomes Assessment Template
Course Assessment and Updates
Program and Curriculum Descriptions
Catalog Description
Flyers, Brochures, Posters
Program Web Site
Overview Syllabi
Detailed Syllabi
Writing Rubric
Presentation Rubric
Proposal Rubric

General Forms, Letters and Templates
Application Form
Admission Recommendation Form
List Of DMIT Applications
Checklist Of DMIT Applicants
Diagnostic Evaluation Interview Record Form
Diagnostic Evaluation Forms and Schedule
Letter Templates
Advising Schedule
Credit Waiver/ Transfer Form
Course Overview Sheet
Curriculum Schedules
Comprehensive Examination Forms
Research Progress Template
Research Support
Dissertation Research Prospectus
Doctoral Research Brochure
Dissertation Research Survey procedures
Research Supervision
Proposal Template
Dissertation Template
Press Releases

Table 1 DMIT Documentation

At the time of writing 57 students have been admitted in the program, 41 have obtained doctoral candidacy, 31 have defended their dissertation proposals, 16 have graduated, and students have published 38 peer-reviewed articles. Interest in the program remains vibrant although applicants frequently do not have the required academic foundation, and are advised to take specific coursework before being allowed to join the program. The economic woes in Michigan have impacted application levels, although some applicants are turning to graduate studies to differentiate themselves. There appears to be a slowdown in progress after students write the comprehensive examinations, arguably attributed to fatigue after 9 terms of coursework, difficulties in identifying an appropriate research topic, and diminished peer support in the individualized research phase. Faculty in the program has a considerable teaching load, which also impacts the amount of time and effort that can

be devoted to research supervision. Despite this faculty have produced 53 peer reviewed articles

Collaboration with a number of enterprises have been established, either through organizations sponsoring students, including Ford Motor Company, GM, Chrysler, Detroit Medical Center, Blue Cross Blue Shield; through members of the DMIT Advisory Board, including American Axel, DTE, IP3 Inc., MPHASIS, EDS, and HP; through benchmarking and best-practice research organizations, such as APQC and AIAG; through software vendors, including Compuware, HP, IBM, Oracle, Microsoft, and Metastorm; and through membership of professional bodies, including BPTrends, The Open Group, PMI, ACM, IEEE, ABPMP, SIM, GL-SPIN. This list

of collaborators is not exhaustive. Interest in the DMIT has lead to exploratory visits to the United Kingdom, The Netherlands,

France, Georgia, India, Dubai, and Taiwan

by faculty and student collaborators.

Software agreements

During the past six years a number of agreements were signed with software vendors, including with the MSDN Academic Alliance, Oracle Academy, Metastorm, and IBM. Other specific software packages for courses are acquired through academic discounts.

Collaboration

DMIT students are actively collaborating in various ventures, such as the Connections 2008 Doctoral Conference, which was hosted by DMIT students in May 2008. The ABPMP Southeast Michigan Chapter, created in 2002, has stimulated interest of graduate students and continues to grow. The chapter hosted a successful ABPMP Mini-Conference at LTU in September 2008.

5. SUMMARY - LESSONS LEARNED

The DMIT, one of the applied doctorates offered by the university, has attracted 57 students so far and has graduated 16 candidates. The paper describes the OA approach that is followed, the improvements made to the coursework in the light of the OA, and progress made in the research phase. Appendix 3 summarizes the data collected

since the start of the program. Whereas some of the data is qualitative some real numbers are now available on which the DMIT can draw to improve the program. Appendix 4 summarizes the research agenda up to the present. Research draws on a number of bodies of knowledge complementary to IT Management, informed by extensive experience of candidates and members of the dissertation committees in business and industry, to provide innovative solutions to problems of practice. Lessons learned during six years of the DMIT have impacted a number of aspects of the program:

1) Offering hybrid modes of delivery for some courses made possible by new education technologies.

2) Continuous updating of course syllabi to reflect the latest ideas and practices in consultation with the DMIT Advisory Board.

3) Modified approaches to preparing students for the comprehensive examinations.

4) Standardizing the research process, and refinements in faculty approaches to supervising the dissertation research projects.

5) Improved quality of faculty and student scholarships as the research phase of the program progressed, with acceptance of more peer-reviewed articles each year since the start of the first DMIT research projects in 2004. The initial focus has been on conference participation with 77 articles published in conference proceedings, and 14 articles in peer reviewed journals since 2002. The goal is to have at least one journal article published along with each completed dissertation.

6) The active research agenda has made the program attractive for professionals in the area, and also LTU graduate students and alumni. This, and the outcomes mentioned in 1) above, formed part of the motivation in the original application for the DMIT to the North Central Association and Higher Learning Commission, who endorse the degree.

7) Senior DMIT students and alumni are actively engaged in professional bodies such as ACM, IEEE, APQC, The Open

Group, Project Management Institute, ABPMP, DAMA to name a few.

8) Despite the poor state of the job market in Michigan at this time DMIT students and alumni have managed to find new in-state positions with relative ease, while some moved to other states to enhance their careers. Table 2 shows the industries and companies where students are employed, with the automotive and education sectors represented most. There is an extensive network of highly qualified professionals in these companies who serve on the dissertation committees as subject or domain experts.

9) With their comprehensive professional experience and strong academic grounding several of the DMIT candidates are teaching courses in undergraduate and graduate IT related programs within LTU as adjunct professors. Some are also teaching at other universities and colleges in the area.

Sector	Company
Automotive and Suppliers	General Motors, GMAC, Ford Motor Company Ford Credit, Chrysler Corporation Volkswagen American Axel
Manufacturing	Milacron Inc.
IT Vendors	IBM, Hewlett Packard, Microsoft
IT Services	EDS (Hewlett Packard) ADT
Consumer Services	DTE
Health Care Services	Blue Cross Blue Shield Michigan (BCBSM) Midland Health Care System Henry Ford
Finance Services	GMAC Ford Credit LLC FMC
	Chrysler Financial
Education	Lawrence Technological University Michigan State University University of Detroit Mercy, Dental School Walsh College Ann Arbor Schools Taiwan Education System SuOn College, Ontario.
Government	Internal Revenue Service
Military	Military - Army Tank-Automotive Research Development Engineering Center (TARDEC)
Consultants	ASI Systems Inc Infotsg Inc

Table 2 Industries Represented in DMIT

During the last three years interest from foreign applicants has been on the rise. These applicants typically study on F1 visas with limitations on their terms of employment. While most of these applicants have the academic credentials for doctoral studies some do not have the business and industry experience called for by the DMIT. At the time of writing attention is being given to ways of accommodating such students.

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APPENDIX 1. ASSESSMENT CRITERIA

1. University Infrastructure
• Doctoral Programs budget • University administrative support • University Research Program Office, policies and procedures • Institutional Review Board, policies and procedures • Intellectual Property Policy • Faculty development programs • Library resources (international standards, journals, books, reference works, …) • Library services (dissertation binding, UMI/ Proquest liaison, interlibrary loan,…)
2. College Infrastructure
• College Advisory Board • Number of Doctoral faculty: teaching • Number of Doctoral faculty: research • College administrative support • Hosting of Conferences and symposia
3. Doctoral Program Infrastructure and Governance

• Program Advisory Board
 	
• Collaboration with external academics
 	
• Collaboration with industry
 	
• Grants
 	
• Doctoral Program Handbook
 	
• Doctoral Research Prospectus
 	
• International standards
 	
• Professional association involvement
 	
• Program templates, forms, guidelines
 	
• Research infrastructure
    – Hardware (virtual computing center, …)
    – Software
    – Research assistantships
    – Administrative support
 	
• Hosting of doctoral symposium

4. DMIT Program Outcomes
• Number of Students Registered • Number of students who passed the Comprehensive Examinations • Number of Dissertation Research Projects

- – Dissertations chaired and supervise by faculty
- – Dissertation committees served on by faculty
- Program Outcomes in terms of faculty:
    - – Journal articles
    - – Conference Proceedings
    - – Patents
    - – Industry collaboration
    - – External academic collaboration
- Program Outcomes in terms of students:
    - – Journal Articles
    - – Conference Proceedings
    - – Patents
    - – Graduated
    - – Achievements & Promotions
    - – Hosting of doctoral symposia and conferences

APPENDIX 2. MISSION, GOALS AND STRATEGIES

LTU Mission: To develop leaders through innovative and agile programs embracing theory and practice.

COM Mission: To improve the quality of organizational life tomorrow by developing strategic managers and visionary leaders today.

COM Goals and Strategies:

- Provide our students with convenient learning centers, enhanced personal services, innovative programs, and alternate modes of instruction.

- Provide our faculty, administrators, and staff with growth and development opportunities.

- Provide our alumni, donors, and industry neighbors with networking and training opportunities.

DMIT Mission: To equip IT leadership with the knowledge of information technologies and leadership competencies to foster innovation in enterprise and industrial processes.

DMIT Goals and Strategies: For working professionals with high levels of managerial and technical expertise in IT:

1) Offer learning experiences focused on problem-solving, leadership and innovation.

2) Enhance learning transformation by applying theory to attain actionable IT management competencies.

2) Cultivate innovation through applied research.

3) Share research results with academic peers via peer reviewed journals and conferences.

4) Be informed of best practices to improve quality and efficiency in business and IT processes.

5) Foster collaboration with industry and commercial sectors.

APPENDIX 3. SUMMARY OF DMIT OUTCOMES ASSESSMENT DATA

DMIT Outcome (State if Program Outcome [PO] / Student Learning Outcome [SLO] / Effectiveness Measure [EM])	Desired Outcome/Result (Cite Measurable Criteria for Success)	Means of Assessment (Evaluation Tool)	Actual Outcome/Result (Cite Data Findings)	Use of Results (Strategies to Improve or Continue Success)
Theoretical outcomes – define and teach the concepts and principles in IT Management.[PO] [SLO]	DMIT students are able to write in good technical style.	Individual and team assignment papers.	Assessment report of each course.	Maintain emphasis on good writing competencies.
Informational outcomes – gain knowledge of leading-edge trends in IT management in global business environment.[PO] [SLO] **Skill-sets** – impart leadership, managerial and technical competencies that students should have upon completing the program. [PO] [SLO]	DMIT students are able to complete and present work on individual assignments, team projects and research to peers and sponsors. DMIT students pass coursework with above 3.3 GPA.	Individual and team presentations during program. Presentations during Seminar 6 of MIS7813.	Individual and team presentations in 12 courses	Maintain emphasis on communication skills; video-tape key presentations for review with students.
Informed of practice – knowledge and awareness of best practices found in business and industry in the field of IT Management. [PO] [SLO]	DMIT students attain candidacy after all coursework is completed	DMIT Comprehensive Examinations (2 exams of 10 hours duration)	41 candidates	Maintain and improve support for student preparation for C.E.
Satisfaction - ensure that students and their sponsors are satisfied with DMIT curriculum [EM]	Students rate the course content as appropriate and relevant. Students rate pedagogy appro-	**All coursework**: Mid-term evaluation Term-end	- 80% of students rate the course content as appropriate and relevant - 70% of the stu-	Continue to improve. Interview sponsors and use feedback to update pro-

Ensure that students are satisfied with pedagogy and didactics [EM]	priate. Students rate instructors as well-prepared and effective. Sponsors continue to support tuition.	evaluation **Major Track coursework** Pre-course Knowledge Assessment. Post-course Knowledge Assessment.	dents rate the instructor as effective	gram.
Applied research- Develop competencies to perform applied research [SLO] Develop ability to conduct advanced research towards innovative solutions [SLO]	Students complete their doctoral dissertation.	Doctoral Dissertation is evaluated by DisCom. Dissertation is defended in an open forum.	16 completed dissertations	Continue to build a research culture in the DMIT. Build experience in leading research and supervision. Improve completion rate of dissertation research projects.
Share research -deliverables with peers in academia, commerce and industry [EM]	Students present peer-reviewed papers at conferences Research papers accepted in technical journals Graduate participation in research seminars Student participation and doctoral conferences	Papers are refereed and appear in Conference Proceedings Papers are refereed and appear in journals DMIT peer evaluation Peer review by doctoral students	34 Conference presentations and articles published in proceedings 4 journal articles 16 Graduates gave research presentations at DMIT Research Seminar, Febr.2008 DMIT students organize and host Connections 2008 Doctoral Conference, May 2008	Increase student research output. Continue tradition of DMIT Research Seminars. Continue participation in doctoral conferences.
Share research – Faculty deliverables with peers in academia [EM]	Faculty papers accepted for conference presentations Faculty papers	Presentations made at conferences Papers appear	43 conference presentations and articles published in proceedings 10 journal articles	Increase faculty research output.

	accepted for technical journals	in technical journals		
Create a tradi-tion of excel-lence in doctoral education in IT Management [PO]	High level of stu-dent satisfaction with DMIT.	Noel-Levitz Survey	90th percentile	Maintain satis-faction level
Collaborate with industry, and professional bodies [EM]	Participation in research studies and initiatives	Number of completed col-laborative projects	1. 3xAPQC projects 2. Member of The Open Group Ar-chitecture Forum and TOGAF9 Work Group 3. 1x AIAG project 4. Host ABPMP Mini-conference	Continue col-laboration with colleagues in industry and academia Increase par-ticipation in APQC studies Increase par-ticipation in The Open Group Archi-tecture Forum, Increase par-ticipation in ABPMP
	Support of DMIT Advisory Board and sponsors	Bi-Annual meeting	Qualitative feed-back about alignment of DMIT curriculum with expectations of practice	Update Curri-culum and Syl-labi

APPENDIX 4. DISSERTATION RESEARCH PROJECTS

Graduated
• Abrahiem, R.: Designing and Implementing Prototype Models for an Integration of Near Real-Time Data Warehousing Architecture with Service-Oriented Architecture, May 2008.
• Andreescu, D.: Improve Business Performance in Global IT Environments - A Systematic Approach, December 2006.
• Basal, A. : An Ontological Approach to IT Infrastructure Environment Discovery and Mapping, May 2007.
• Kakish, K.: Improving the global supply chain through the tightening of IT Security, December 2007.
• Khatib, Khalid: The Role of IT in Mergers in the Banking Sector.
• Konda, D.: An Integrated Knowledge Management Framework of Information Systems Development Projects (Sponsor: GM), May 2008.
• Kopaliani, D: Kopaliani, D.: Architecture of Digital Asset Systems for Libraries, December 2007.
• Kraft, T.: Systematic and Holistic IT Project Management Approach for Commercial Software with Case Studies, May 2008.
• Li, J.: The Enterprise Goes Mobile –a Framework and Methodology for Creating a Mobile Enterprise, December 2006.
• Makar, A.: Assessing Critical Success Factors in Earned Value Management, August 2008.
• Nnolim, A.: A Framework and Methodology for Information Security Management, December 2007.
• Rajabion, L.: Impact of E-commerce on Export Development for Small and Medium-Sized Enterprises in Iran, August 2008.
• Salam, M.: An Approach To Electronic Negotiation of Business Services, August 2008.
• Van, D.: An Approach to Integrating Business Rules of Legacy Systems with the Enterprise Architecture (Sponsor: IBM), December 2006.
• Walker, L.: A Process Improvement Framework and Methodology for Tertiary Education, December 2007.
• Warner, D.: Effective and Innovative Use of IT to Reduce Automotive Warranty Costs (Sponsor: Ford), December 2007.

APPENDIX 4. DISSERTATION RESEARCH PROJECTS (CONT.)

In Progress
• Abaas, K.: Impact of Enterprise Architecture on Agility and Coherence.
• Allour, K.: A Research Study on the Correlation between Critical Success Factor Management, Maturity and User Satisfaction with ERP Implementation Projects.
• Alomari, J.: Ontology for Knowledge Management of Enterprise Architecture.
• Chen, G.: Integration of Business Process and IT Infrastructure Management into SOA.
• Askin, A.: Proposal in development.
• Atilgan, K.: Proposal in development.
• Basal, A.: SAAs in IT enabled Education Systems.
• Bilan, T.: Proposal in development.
• Dawwas, M. : IT Projects in Critical Situations (IT-PICS) - A Systematic Approach to Project Intervention and Rescue.
• Foster, R.: Modeling the technical IT Architecture of a Hybrid Vehicle.
• Khoury, F.: Data Warehousing and Reporting: Framework and Methodology.
• Li, C-M: Improving Business – It Alignment through Business Architecture.
• Lyons, T.: The impact of it outsourcing on surviving employees: managing survivor syndrome symptoms (Sponsor Chrysler).
• Tai, W.: Proposal in development.
• Wachob, W.: Funding Technology Refreshment in the Private College Setting.

APPENDIX 5 –DMIT CURRICULUM

Term	Major	To-tal CH	Minor	To-tal CH	Research Methods	To-tal CH	Run-ning Total
1	MIS8013 IT Life Cycle Processes	3			MIS7823 Quantitative Methods I	3	6
2	MIS8023 Advanced Data Management	6	Minor 1	3			12
3			Minor 2	6			15
4	MIS8033 IT Leadership & Management	9			MIS7833 Quantitative Methods II	6	21
5	MIS8043 IT Systems Architecture	12			MIS7843 Modeling and Simulation	9	27
6			Minor 3	9			30
7	MIS8053 Advanced Topics in IS	15			MIS7813 Research Methodology	12	36
COMPREHENSIVE EXAMINATION							
8	DIS I Dissertation Proposal	3	Develop and Defend Proposal				39
9	DIS II & DIS III	9	Literature Review				45
10	DISIV & DISV	15	Conceptualization				51
11	DISVI & DISVII	21	Experimentation				57
12	DISVIII	24	Finalize Dissertation				60
DISSERTATION DEFENSE							

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