

PD21: An Education Consortium for Product Development Leadership

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Abstract

Business survival and growth is critically dependent upon the ability to develop new products and services, yet there has been a distinct scarcity of educational programs whose overarching focus is product development. With support from the NSF and the Center for Innovation in Product Development (CIPD) at MIT, a university consortium was formed in 1998 to disseminate a Master of Science program focused on product development leadership. This paper reviews the evolution of “PD21”, the “Education Consortium for Product Development Leadership in the 21st Century,” from creation of the template Master’s degree program at MIT and formation of the consortium, to the transfer of curriculum to three other member schools (RIT, the University of Detroit-Mercy, and the Naval Postgraduate School), to the future of the consortium.¹ Attention is given to the complexities and challenges associated with collaboration within and between universities.

Introduction

Recognizing the intimate relationship between new product development (NPD) and business growth, companies worldwide are investing heavily to enhance performance across the broad spectrum of activities that comprise the total life cycle product development system. In 1996, the Massachusetts Institute of Technology (MIT) founded the Center for Innovation in Product Development (CIPD) to link academic research with industrial experience as part of an overarching objective to advance the theory and practice of NPD. Industrial partners within CIPD, while reaping the benefits of applied research, also understood the importance of cultivating leaders within their organizations who could drive the adoption of best practices in NPD. Therefore, in 1998, CIPD, MIT, the Rochester Institute of Technology (RIT), and the University of Detroit Mercy (UDM) joined together with key industrial sponsors to form an educational consortium for the purpose of disseminating a Master’s degree program that would provide the educational foundation needed by future leaders of technology-based organizations. “PD21”, the “Education Consortium for Product Development Leadership in the 21st Century,” was established to address a gap between existing academic programs and a business need for technically grounded leaders, individuals with a strong systems perspective and knowledge base in both engineering and management.¹ Instead of creating a “concentration” within an established degree framework (eg. MBA or MSIE), PD21 partners viewed product development as the driving principle, supported as necessary by business and

(systems) engineering disciplines. Targeted students include mid-career engineers and technical specialists with career paths to senior management.

PD21 began as a two-year pilot project with funding from the National Science Foundation, during which time the consortium grew to four universities, adding the Naval Postgraduate School in 2000. PD21 is a consistent educational program based on MIT's SDM Product Development curriculum as a platform. In this way, graduates from any of the PD21 partner universities share a common language and set of concepts that would facilitate communication and networking across corporate and geographical boundaries. Tailoring of the curriculum to meet the needs of constituent organizations served by each university was accomplished through case studies, problem sets, thesis projects, and electives.

The program, as envisioned by its founders, has several distinguishing features, all aimed at providing the best educational foundation possible for future leaders of technology-based organizations. First, the intellectual content focuses on developing a leadership perspective of the "end-to-end" or total life cycle product development system, integrating engineering and management elements. Conventional product development programs dwell mainly in the technical realm, whereas the PD21 programs consider how a company's business strategy, vision, and core capabilities coupled with the voice of the customer combine to determine product strategy and create best-in-class product portfolios. A second feature is the anticipated close interaction between program developers and leaders from industry and government, nurtured through CIPD and the PD21 management structure. The curriculum focuses on competencies targeted by these leaders as essential to the management of systems in today's enterprises. The companies provide important customer requirements, case studies, and act as test beds for development and deployment of new practices and tools. A third feature is a shared language and set of concepts that span boundaries within and between universities and sponsoring companies, to the benefit of faculty, universities, students and their companies. A fourth feature is the ability to tailor a robust curriculum to the unique requirements of a particular region or industry, as mentioned earlier. Finally, it was envisioned that PD21 would facilitate the flow of two powerful streams of information into the curriculum and classroom: the latest practices and tools provided by university research and the experiences of industry provided through case studies.

For companies and students, the aforementioned characteristics associated with collaboration between PD21 schools, suggest a number of benefits. Companies are able to develop leaders from within their organizations in a shortened timeframe, educated leaders for the growth engine of the firm. As mentioned above, PD21 provides a forum for sharing across companies and industries. Students gain access to the latest thinking and practices in systems design and product development, for both immediate and long-term impact on job and business performance. Universities, in addition to benefiting from state-of-the-art courses, have the opportunity to build research partnerships, to leverage tools and metrics across the consortium, and to build brand recognition. Likewise, faculty have an established mechanism to improve their courses and build research partnerships.

For such a master's degree concept to have a significant impact, it must be deployed at many universities around the country. Needless to say, this presents enormous challenges. As developers of joint programs know, it is enough of a challenge to create collaborative working groups within a single university, much less between universities. Traditional academic culture encourages individualism. Turf issues between departments can become especially problematic as boundaries between traditionally distinct disciplines blur, and as new cross-disciplinary programs compete with single-college programs for resources and students. Each academic college (department) and university has its own vision, mission, priorities, and culture, yet each institution offering such a master's degree must share a common vision and set of concepts that form the basis of the curriculum. If an active partnership such as PD21 is to be sustained, all stakeholders must recognize clear benefits to the partnership and must prioritize associated activities to maintain a sense of urgency. As PD21 looks to its future, beyond the pilot phase involving four universities, it must develop a strategy and operating plan that provides a value-adding framework for collaboration between institutions offering state-of-the-art product development educational programs.

History

In 1995, MIT worked closely with a number of industrial representatives to create a professional-level education program in the development of systems and products. This program, the Systems Design and Management (SDM) program, is offered jointly by MIT's School of Engineering and the Sloan School of Management, and combines an education in systems engineering and design with essential management concepts. After the launch of SDM, CIPD industry sponsors requested a specialized track to address the product development process. With the help of CIPD, the SDM program introduced the Product Development Track, adding a number of new courses to the curriculum. The SDM program's Product Development track became the curriculum platform adopted by PD21 for dissemination beyond MIT as the "Master of Science in Product Development (MPD)." From the pilot of eleven students in 1996, the SDM program now admits about 50 students each year.

In 1998, with leadership from CIPD and key industrial sponsors Ford, Xerox, and ITT Industries, universities in Rochester (RIT) and Detroit (UDM) were identified as candidates to deliver the product development leadership curriculum to employees of those companies located in Rochester and Detroit. The process of starting each new program was accomplished quickly, taking approximately one year from concept to launch. (RIT and UDM launched their MPD programs in January 1999). RIT and UDM faculty were provided syllabi and, in most cases, lecture notes to facilitate curriculum transfer. Direct support from MIT faculty was critical to this transfer process. PD21 meetings provided a forum of exchange between MIT faculty who originated courses and faculty from UDM and RIT who would be customizing courses. Also included in these meetings were industry sponsors and administrators from partner schools, as part of the detailed review and exchange process. Each university engaged administrative representatives from their respective colleges of engineering and business to champion the curriculum approval process germane to each school and to deal with potential deal-breaking issues such as intellectual property rights. Program directors were hired by each school prior to program launch.

In late 1999, the Naval Postgraduate School (NPS) in Monterey became engaged in the PD21 pilot project and launched its version of the MPD program in September 2000. NPS's orientation toward government and defense acquisition provided a valuable complement to the other institutions already in the consortium. While the curriculum approval and transfer processes mirrored those undertaken with RIT and UDM, NPS faced unique challenges associated with intellectual property rights, program championing and approval.

Since the launch of the NPS program, the intensity associated with transferring curriculum and starting new programs has significantly decreased, with each university focused internally on identifying new sponsors and growing their respective programs.

Management Process

A significant coordinated effort was required during the pilot phase as curriculum from MIT was transferred to partner universities and programs were approved and launched. Meetings during the first two years were held on a monthly basis, either by videoconference, audio conference, or in person, with locations rotating between member schools. Meetings were facilitated by the PD21 Director, whose position was funded by CIPD. Regular attendees included program directors and at least one senior level administrator from each institution, industry representatives, and several CIPD staff members. Special topics meetings, such as those associated with curriculum development or transfer, engaged faculty and others as appropriate. Every participant had an equal voice in setting the agenda and participating in discussions. Meeting durations have ranged from one hour, to half-day or even full-day sessions.

Meeting topics have ranged from a discussion of consortium operation, to curriculum, to industrial input. For instance, the topics slated for discussion during 2000 included: 1) proposed structure of PD21 beyond the pilot phase, 2) evaluation of the pilot phase, 3) development of a continuous curriculum improvement process, 4) development of new proposals for outside funding, 5) sharing lessons learned and best practices, and 6) facilitation of ongoing operations.

Each summer since 1998, the PD21 team has organized a workshop to address both administrative and curricular issues. Faculty from participating universities are invited to attend, as are industry representatives, and time is devoted to formal and informal meetings between faculty from partner institutions.

Program assessment has remained the responsibility of individual universities, although tools and techniques have been shared across the consortium for discretionary use by each school. Interviews (pre-admission and post-graduation), course evaluations, end-of-term evaluations, and advisory boards are some of the vehicles utilized to evaluate the individual MS programs and gain valuable insights into improvement opportunities, which have often been shared at the consortium level.

As NPS's program was launched and the pilot phase completed near the end of 2000, the frequency of PD21 management meetings has decreased significantly. A number of factors have contributed to this:

- A reduction in urgency caused by a natural shift away from the external focus needed to start PD21 programs at partner schools, to internal focus at each university on sustaining its own program. Strong corporate sponsorship is a basic assumption underlying the master's degree concept, but considerable weakening of the economy has negatively impacted enrollment at most universities and has further encouraged internal focus and attention to the short term.
- As CIPD changed its financial and operational model, funding has no longer been available from CIPD for a PD21 director. Support for the consortium vision and its objectives remains strong within CIPD and PD21 partner institutions, but the time has come for PD21 to develop a funding model and operational plan for the future. Dedicated leadership is an essential ingredient.
- As each university examines its priorities, given limited resources, the benefits associated with any substantial investment must be clear, especially as it may impact scarce faculty resources. With completion of the pilot phase, other priorities at partner institutions have superseded those associated with PD21, and PD21 has not effectively articulated a plan for the future. As each university gains experience with its own product development program, additional benefits associated with collaboration and broader recognition of the Master's program concept are expected to renew interest in consortium activities.

Challenges

While the Master's programs at PD21 schools share challenges with most other educational programs – attracting new students and sponsors, substantiating program benefits, insuring faculty availability, maintaining high quality and relevant courses – unique challenges exist for the MPD program at sponsoring universities:

- Newness of the degree. As with any new program, there exists a lack of familiarity by prospective customers, uncertainty about a university's long-term commitment, questions about the value of the new degree relative to traditional offerings with brand recognition, and a low number of graduates and sponsoring companies to provide testimonials of program benefits.
- Dependency upon corporate sponsorship. Tough economic times and the resulting myopic focus of most companies on cost cutting, coupled with the discretionary budget status of education and training programs in general, represent significant challenges to such programs that depend upon a strategic vision and long-term commitment from corporate executives. On the positive side, as individual candidates for this type of program begin recognizing the market value of this educational program, PD21 schools are likely to see an increase in self-sponsored students. Downstream, as graduates proliferate and demonstrate program value, and as they continue to take jobs of increasing responsibility within their organizations, it is envisioned that the MPD program will become embedded in leadership development strategies and will gain stronger corporate sponsorship.

- Internal support for multidisciplinary programs. Although product development education is inherently multidisciplinary, programs that span colleges within a university may be given lower priority for resources than is given by those colleges to their core programs. Furthermore, recognizing that educational objectives and target markets associated with a multidisciplinary program may overlap to some degree with those of existing programs, a cross-college program may be perceived at times as a threat to the status-quo. Long-term value created by portfolio expansion may become a casualty of perceived negative impact over the short-term on entrenched programs, particularly during periods of low enrollment.

At the consortium level, other challenges exist:

- Competition between on-site and distance-delivery programs offered by PD21 partners. Although the market opportunity for educational programs in product development leadership is considered quite large, competition in the early stages of a consortium presents a negative incentive to cooperation. Fortunately, PD21 members have taken the long view and feel strongly that facilitating a national agenda for the Master's degree program will ultimately benefit all partners.
- Intellectual property rights. While not insurmountable, considerable attention must be paid to this. Institutional policies vary and sensitivities exist at the faculty level, department level, and university level, as members look to share and leverage intellectual property.
- Resources and funding for ongoing support of the consortium, and a clear value proposition for all constituents (faculty, programs, universities, industrial sponsors). With tight budgets, overburdened resources (especially faculty), and other non-PD21 priorities, the value to consortium participation must be unequivocal for all.
- Brand identity and recognition. Maintaining a lock-step curriculum across PD21 schools is an unlikely path forward, but it is important to maintain consistency at a level that ensures a recognizable identity for PD21 programs. PD21 programs must be clearly differentiated from other recognized degree program such as the MBA. Building brand recognition is expensive and time consuming.
- Building a scalable architecture and operating plan for PD21. A roadmap that reenergizes participants and brings a sense of urgency to consortium priorities is key, especially given resource constraints. A considerable amount of effort has already been spent in this area, but closure is needed.

Future of PD21

Conditions that drove the creation of PD21 in 1998 certainly remain in 2002. PD21's founders understood that our nation's competitiveness depends upon our ability to consistently deliver innovative products and services. They recognized that accomplishing this requires a cadre of product development leaders and change agents across the nation who understand and practice both technology and business skills. Therefore, an entity that provides a framework and forum for networking between universities and companies with this shared vision has a valuable role to play.

As the PD21 consortium works to extend its influence beyond a handful of universities, it must adopt a scalable architecture that enables efficient operations focused on high priority value-adding activities, as perceived by all members. University educational systems are a cornerstone of national industrial development, so the consortium must continue to foster university-industry partnerships and substantially increase the number of students and companies who benefit. It must increase the impact of its educational programs by facilitating the ongoing development of world-class curricula, by assisting member universities in improving individual programs, by facilitating research collaboration, and by helping organizations better utilize program graduates. It is unlikely to be practical or desirable to maintain a common curriculum at partner schools given the diverse needs of constituents and the diverse opinions of faculty who ultimately control curriculum at each university; however, it is essential to promote a shared vision, language, and set of basic concepts.

Maintenance of this shared vision, and of the program's momentum, will require ongoing commitment from the PD21 partner universities. This commitment can only be sustained through recognition of the benefits to collaboration. To move forward into the next phase of activity, the program will need an operating plan that includes a new funding model and a process for developing a new program leadership structure.

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