

A Strategic Vision:

Building on and Strengthening the Success of the LFM and SDM Programs **Leaders for the Total Enterprise**

History

In 1988, MIT and industry formed the Leaders for Manufacturing (LFM) program and partnership to help ensure the social and economic well-being of society by discovering and translating into teaching and practice the principles that produce world-class manufacturing and manufacturing leaders.

In 1996, addressing a critical need expressed by industry that its engineers and product designers did not have a systems perspective, MIT, again in partnership with industry, created the System Design and Management (SDM) program to educate future technical leaders in architecting, engineering, designing, and managing complex products and systems. Additionally, industry urged MIT to develop the SDM as a professional degree program that utilized advanced information and communication technologies to deliver courses at the work place. MIT responded and the partnership continues to work to understand how to enhance this new mode of engagement.

Both these programs have been very successful in addressing the needs associated with the time period in which they were set up and in educating a new type of technology-based leader ready to address these challenges. In particular, both programs have taken a tripartite partnership approach that requires active leadership from the Schools of Engineering and Management and the over twenty partner organizations. This allows a continual flow of information as to the changing needs within our partner companies and organizations and an ability for the partnership to respond to these needs.

Today's World

Today's organizations face an environment that is remarkably different from that of the recent past. The playing field has evolved such that global thinking **must** be the starting point. This global environment creates an increasing set of social and economic demands that, when coupled with changes driven by technology and information access, feed an ever-accelerating rate of required change for the organization. The evolving technological and organizational systems that result are of greater complexity and capability than ever before, and these entities exist in a world where we are seeing wider availability of information with increased ease of access. This evolving environment require more **integration within and across organizational boundaries** along with new forms of partnerships that rely on **cross-cultural understanding and cooperation and coordination across multiple stakeholders**. We see the need for new **career and leadership models** to support the constant innovation and flexibility this environment

demands. These changes all lead to systems and processes where greater depth and breath of understanding is required and where **knowledge is the critical asset**.

This environment and the associated issues result in three key challenges for organizations. The first is to address an accelerating cycle of reorganization and renewal of existing organizations and more frequent emergence of new organizations and ways of doing business. The second is to establish and understand the seamless operation across multiple boundaries (operational, temporal, cultural, and organizational). The third is the creation of competitive advantages through the critical process of *the Knowledge Cycle* involving knowledge generation, capture, transfer, and application. And this must be undertaken in the context of the absolute demand to focus on the customer needs.

The Response

It therefore becomes essential that our partnership addresses the problems and issues of the present **and** anticipates, identifies, and addresses the problems and issues of the future. The creation of the LFM and SDM programs allowed us to address the issues of the recent past and of the present and ensured that we continually focus on developing excellence in the critical disciplines of manufacturing and product design and development. These challenges are as important today as ever and we remain fully committed to the LFM and SDM programs and their core missions. But in addition, as we look to today's and tomorrow's challenges, MIT is building on the successes of LFM and SDM by developing a new initiative to complement LFM and SDM. We are calling this the Leaders for the Total Enterprise (LFTE). It will both link LFM and SDM by a single administrative structure and serve as the common platform for carrying these programs into their next generation of improvement and development. Stated most succinctly, our vision for LFTE is to build:

a partnership for knowledge management whose mission is to develop new educational, career, and partnership models, and thereby to produce leaders and principles for technology-based organizations and their enterprises

In this document we outline our vision for how we hope to build on the strengths of the LFM and SDM programs to create and implement LFTE and, in doing so, to come full cycle and leverage the learnings of LFTE to further strengthen LFM and SDM. As the vision statement suggests, we see the challenge of managing knowledge in a creative partnership linking MIT with industry as the key challenge and opportunity motivating the creation of this new initiative. We also outline our strategy for implementing this vision organized around the idea of the "Knowledge Management Cycle".

The Knowledge Management Cycle

The key to knowledge management is defining and bringing into conscious practice the Knowledge Cycle (see below) including the generation, capture, transfer, and application of the knowledge that is core to all the activities of the enterprise and its stakeholder relationships and to thereby develop a *knowledge management strategy*.

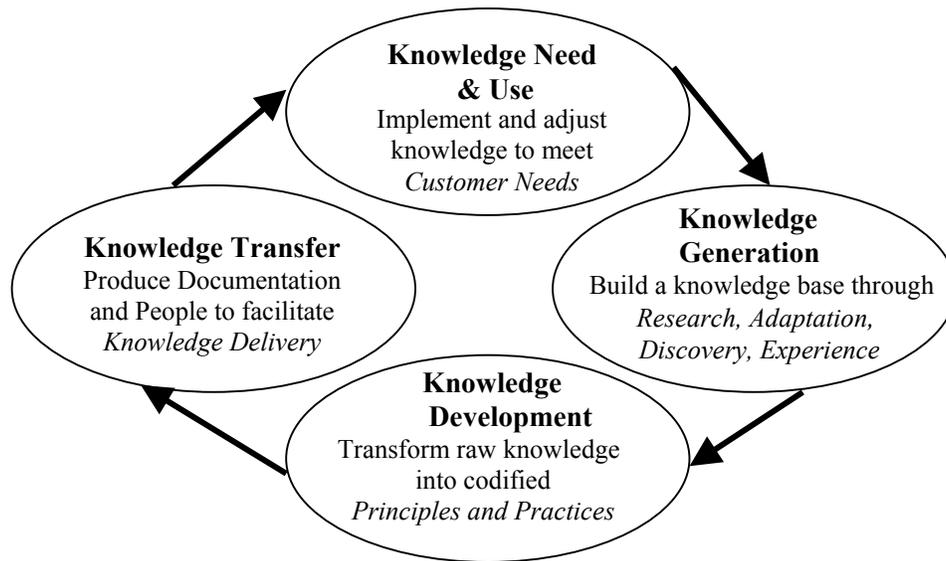


Figure 2: The Knowledge Cycle

We see our work guided by this Knowledge Cycle. Our research and teaching activities must be driven by a clear understanding of the changing information and knowledge requirements faced by industry and associated enterprises. We must transform ideas and findings generated through research into delivery modes that reach our stakeholders efficiently and effectively and in ways that can be adapted and used to meet customer needs. Finally, the knowledge cycle must serve not just the immediate university degree and research programs, but also the growing needs of graduates and organizational partners for lifelong learning opportunities. Indeed, our broadening stakeholder base will include organizational partners, their individual employees, alumni/ae, current students, the broader undergraduate and graduate student population, faculty, staff, and MIT itself as an enterprise. LFTE and the individual SDM and LFM programs will only be successful if we support the ongoing process of organizational learning and utilization of new knowledge as it emerges from different program initiatives, partner interactions, and stakeholder needs.

Interest in lifelong education and a key means of its delivery--distance education--is not new to industry and higher education. But we believe that these issues have received second-priority attention both at many leading research universities such as MIT and in industry thus eliciting concomitant behavior. This must change. We envision this evolving LFTE partnership as a laboratory in which the principles concerning lifelong and distance education can be understood and translated into practice and thereby develop *a lifelong educational strategy*. In the new economy, every worker will need to be a knowledge worker and learning will need to take place over the life of a total career. By necessity, distance education must become a competency of global enterprises as learning and collaboration increasingly take place with the learner removed from the knowledge provider by time and place thereby making *the pursuit of distance education* a key issue for this partnership.

We propose extensive thrusts aimed at defining and understanding each of these areas. We believe that the application of the research and practices defined by these four areas will strengthen the core programs of LFM and SDM, the larger enterprise of LFTE, and the overall partnership. To be effective, the partnership will have to commit to research in the same way that we have researched past thrusts such as Product and Process Life Cycles and Scheduling and Logistics Control. We envision multi-pronged approaches including the active encouragement of LFM internships and SDM thesis projects at and with partner companies, the engagement of all partners in the process, and alliances with other enterprises as necessitated by the work and the need for progress in addressing the needs of our partners and our overall enterprise.

Knowledge Management Strategy

A key capability of the future will be the approach or organizations to *knowledge management*. This is an emerging need that is not, as of yet, understood. Similarly, fifteen years ago, the concept of supply chain was not understood. But once the enterprise supply chain was identified and its workings more clearly defined, companies took innovative stances regarding their suppliers that revolutionized manufacturing. We believe that organizations are at a similar juncture regarding Knowledge Management. Knowledge is now being readily accepted as the only remaining sustainable resource that can provide a competitive advantage. As knowledge becomes the competitive differentiator, then learning (and thus a coupling to Thrust 3) and doing must become inseparable elements of an individual's job. Industry, government, and academia must therefore become inseparable elements of the knowledge supply chain.

While effective and efficient education and training represent important parts of any knowledge management strategy, effective knowledge management can also allow operations to do things faster, better, and cheaper. It is faster and cheaper to "move" knowledge as opposed to physical entities. An effective knowledge management strategy can enhance an enterprise's ability to delay converting knowledge into physical entities. This allows more flexibility to quickly and cheaply react to changes in customer needs as well as reducing the investment in committed material and physical assets.

Clearly there are multiple definitions of knowledge management in use and no one definition has received general acceptance. Leaders for the Total Enterprise recognizes that knowledge management is still a nascent discipline. While we will stay abreast of the discussion and progress regarding the definition of knowledge and knowledge management, we have chosen to limit our definition of knowledge management to that which entails the management of the *Knowledge Cycle* and the four elements that comprise it.

We see the knowledge cycle involving the transactions and activities of an organization that define the processes by which knowledge is created, codified, shared, and utilized. The knowledge cycle is key and should be recognized as an emerging competitive opportunity. Articulation and continuous improvement of knowledge cycles within total enterprises can lead organizations to better management of their total knowledge assets and better determination of the cost/benefit ratio of knowledge activities and therefore better optimization of knowledge investments. We propose a research agenda to address these potentials

This proposed overall research agenda in this thrust area calls for proactive experimentation and development of new approaches to each of the four interrelated segments of the knowledge cycle: generation, development, transfer, and use, as well as the overall aspects of the cycle. To do this the LFTE partnership will need to pay attention to understanding how to foster knowledge environments in which people are encouraged to create, learn, share, and use knowledge and information. This research agenda links to our work in establishing principles of the total enterprise. For example, it becomes important to develop the enterprise principles and rewards systems that facilitate such knowledge sharing across organizational boundaries. A key to this will be research on how to value knowledge assets and intellectual capital. The specifics of the research work will evolve over time and must be pursued in tandem with all partners. Yet, it is important to identify some possibilities to begin this process.

Knowledge Generation—Innovation and creativity are at the heart of knowledge generation. Thus, issues surrounding how to teach and/or facilitate innovation and creativity as well as the use of teams and virtual teams for innovation are important. Furthermore, understanding the relationship between the knowledge generation process and the need/use process will be important vis-à-vis the supply/demand and push/pull issues of technology and knowledge that drive the product commercialization process.

Knowledge Development—The transformation of tacit knowledge to explicit knowledge is a key process where the issues involved must be identified and understood. Additionally, the means by which such knowledge is codified and suited for individual and organizational learning must be addressed. The ability to “mine” knowledge, within individuals and teams and associated with information and data storage banks is a further key consideration.

Knowledge Transfer—Organizations must learn how to increase their ability to transfer knowledge to their various stakeholders. This involves issues such as the need to understand differing learning styles and environments, how this facilitates the process, and, furthermore, how such learning changes over a career (thereby interfacing with Thrust 3 on *lifelong education*). New technologies can play an important role in facilitating this transfer (thereby interfacing with Thrust 4 on *distance education*). Managing the knowledge that lies outside traditional organizational boundaries will become increasingly important as will learning how organizations treat knowledge as a tradable commodity in terms of rewards and recognition.

Knowledge Need/Use—The development and specification of knowledge requirements and how such requirements are translated to and interpreted by and for knowledge generators will be key processes to study and understand. This research area corresponds to issues of how to search for needed knowledge and, furthermore, how to recognize when one has found such knowledge.

Such knowledge management is an exciting frontier for research and experimentation that holds the potential for driving continuous improvements and innovation. We believe the best way to expand this frontier and apply what is learned is to address the total cycle of knowledge management outlined here.

Lifelong Education

The principles associated with the *total enterprise* and *knowledge management* must be supported by a commitment by organizations to *lifelong education*. This is mandated by our overall working premise that knowledge and its management will be the key determinant and the competitive advantage for the total enterprise. With the increased and easier availability of information, individual knowledge and skill needs will continuously change. No longer will one organization take care of an employee for a lifetime. Now, industries, companies, and organizations must draw upon an expanded and continuously updated knowledge supply network to adequately meet the individual and organizational knowledge needs. All this points to the need for lifelong education.

Our experience indicates that the main reason little progress has been made in this area is because the collective “we” (the individual, industry, government, academia, and the community) do not regard it as a key issue impacting on our short-term results. That is, we do not see the reward in the short term for effort expended in this regard. Without this “pull” as a critical (business) need, all the sharing of new tools and best practices will suffer from second-priority behavior (i.e. it is the “right” thing to do, but not a survival issue). Industry and the nation treated “quality” in this “second priority” manner until it became a competitive crisis. But as line managers recognized that their “poor quality” (in terms of product, processes, and administration) was causing them to miss their bottom-line business objective, TQM spread through U.S. manufacturing. Line managers made quality a survival issue that was measured and reviewed on a weekly/daily basis, along with other critical bottom-line issues of manufacturing such as costs, delivery, performance, inventory, and cycle time. In essence, quality was transformed from a staff issue (nice to do) to a line issue (key job responsibility)

Leaders for the Total Enterprise believes that it will become critical that organizations not only effectively provide knowledge *to* their total workforce, but that they also effectively use the knowledge provided *by* this total workforce. This implies that everyone in the enterprise must be valued as a learner and as a teacher. This broad concept of continual acquisition and skill development at all levels of the workforce drives our concept of lifelong learning. This couples with our second strategic thrust of knowledge management since organizations will need to develop an intellectual agenda to address this aspect of knowledge management for and with individuals. And this learning must go beyond individuals to achieve true *organizational* learning.

Our research agenda in this thrust area calls for the investigation of five key areas: how people learn, the definition of the roles of all stakeholders, exposure levels and means, the development of educational supply chains, and the definition of quality control in this context. This agenda is related to the management of the knowledge cycle (Thrust 2) and to practices and principles of the total enterprise (Thrust 1). But this is an area that we believe is so key to the success of future organization and is where an academic institution can play a particularly important role that it deserves special and specific mention. Nevertheless, we expect considerable input from and overlap with the other three thrusts. The specifics of the research work will evolve over time and must be pursued in tandem with all partners. Yet, it is important to identify some possibilities to begin this process.

Learning how people learn--We believe that teaching in the context of lifelong learning in organizations will need to be aligned with the way people learn. More research needs to be conducted regarding this very important area if we are to successfully educate targeted small groups of learners or whole populations within our partner organizations for present skill needs and knowledge needs over a lifetime.

Levels of exposure and how/when to access--**The needs of people for learning will not always correspond with what is possible within the work environment. It is therefore important to understand whether and when learning occurs best *in situ* -- minute by minute, hour by hour; in 2-3 day immersions, or parts of days. Furthermore, the form that this exposure can/should take is a key issue. And these items couple to considerations as to the segmentation of the pieces of education. These considerations also clearly relate to how knowledge is best generated for transference to the learner. For example, the question as to whether learning always need to take the form of a full subject or learning module, or as several pieces that make up an academic program, or even a full degree is a vital one. Again, new models of education involving both the Institute and our partners will need to be experimentally considered to assist us in defining the key characteristics and flexibility of a lifelong education program.**

Developing Educational Supply Chains—LFTE believes that the key issues for organizations in the next decade is how well they manage their knowledge processes. Understanding their knowledge process begins with the company identifying what they consider to be their core competencies and the knowledge supply chains that support those competencies. This will include identifying for each of the four segments of the Knowledge Cycle (generation, capture, transfer, and application) what part of the knowledge process they are willing to “outsource” to others and what they will want to do “in-house” and protect as proprietary. But it will be just as critical to develop knowledge supply chains for knowledge elements of the business that they view as “commodity” processes and ones that can be outsourced. Failure to have proper access to the pertinent knowledge of their outsourced commodity process such as sub-assembly manufacturing, or Information Technology, will create a vulnerability should business conditions and strategies change and require that these processes be brought back in house.

We believe that the model of the university solely as a place to go to acquire knowledge must evolve in a number of respects. We propose that the conceptual structure of an “educational supply chain” best fits the lifelong educational need. For example, as in any enterprise, there are a vast variety of partnering possibilities to address the needs of the learner. But this raises a number of issues surrounding how the learner engages the supplier, how a supplier pulls together an effective chain, what the customer really needs (e.g. knowledge, certification that the knowledge has been gained, a “stamp” of level of capability),

as well as the whole set of issues surrounding intellectual property, among others. As traditional boundaries of academic institutions are crossed, these organizations will also need to think in lines of being total enterprises. This will require the development and understanding of system metrics and reward systems for each partner's contributions.

Defining roles of each set of stakeholders -- We believe that enterprises will need to define roles of each set of stakeholders in an environment in which Lifelong Education is fostered. Depending on the situation, a stakeholder could be a learner or a sharer of experience. Mechanisms for evaluation will need to be put into place to make certain that curriculum or course delivery is responsive to changing needs and there is a continuous improvement of quality.

All the stakeholders in the LFTE Partnership must be aware of and be part of *organizational learning*. For example, the lessons learned from studies of the utilization of LFM graduates over the first decade of experience have taught us that organizations gain the full return on their investments in individuals and the resident knowledge only if they build supportive networks among alumni, supervisors, and peers in their organizations that can transfer individual learning into organizational learning. We need to experiment with ways to encourage such network-building approaches to organizational learning and related means to couple stakeholder roles to organizational needs.

Definition of quality control in context of lifelong education--Of necessity, quality control will be a major issue facing any Lifelong Education thrust. How one determines whether the knowledge transferred has been received, and whose responsibility it is (educational institution, individual faculty member or content specialist, partner company, or employee) to check for "proper reception" are two key questions. Ultimately, all partners will need to sort out the issue of responsibility in regard to individuals pursuing education and as to assuring that the individuals learned what was taught.

Working towards the formation of a true learning community will require experimentation, evaluation, and cycling on the success with learning from all cases. And this will truly require partnering where the overall partnership can indeed be a laboratory for this work. As we move forward, we will help to identify our strategy for lifelong learning, our associated overall intellectual agenda, and thus support our total enterprise principles and our evolving knowledge management strategy.

In Closing. . .

With the solid foundation of the LFM and SDM academic programs in place, the Leaders for the Total Enterprise partnership is proposed to anticipate what the new *challenges* will be and to address these and

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to make them key *opportunities* for organizations **before** they become the critical *problems* facing such organizations . Clearly our vision as a partnership for knowledge management is still under development and all our organization partners will contribute significantly toward defining, researching, and addressing the four thrusts.

Leaders for the Total Enterprise
Building technology-based leadership