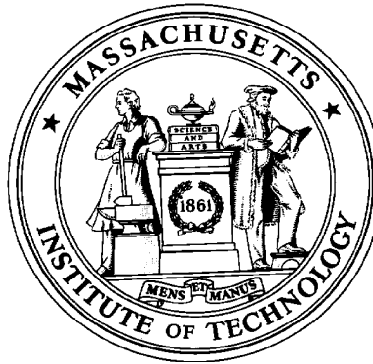


VERSION 1.0



LEAN AEROSPACE INITIATIVE

# ROADMAP FOR BUILDING LEAN SUPPLIER NETWORKS (ROADMAP TOOL)

Center for Technology, Policy and Industrial Development  
Massachusetts Institute of Technology  
Cambridge, Massachusetts

March 15, 2004

**FOR MORE INFORMATION: Please contact:**

**Dr. Kirk Bozdogan**  
([bozdogan@mit.edu](mailto:bozdogan@mit.edu); tel: 617-253-8540; fax 617-258-7845)

© Massachusetts Institute of Technology, 2005

## SECTION I -- INTRODUCTION

This document contains VERSION 1.0 of the ROADMAP TOOL developed by the LEAN AEROSPACE INITIATIVE (LAI). This tool lays out a structured process (“how-to”) for evolving lean supply chain management capabilities in order to build lean supplier networks. The tool is intended for use by a cross-section of an enterprise’s top-level as well as mid-level leadership who are collectively responsible, in one way or another, for supply chain management. This includes people from virtually all parts of the enterprise – engineering, manufacturing, contracting, quality, procurement, supplier development, and other areas. As it will become increasingly apparent in examining this document, designing and managing lean supplier networks “takes the entire enterprise.” This view is in sharp contrast with the traditional practice of consigning supply chain management functions too narrowly to the traditional procurement, material or purchasing departments.

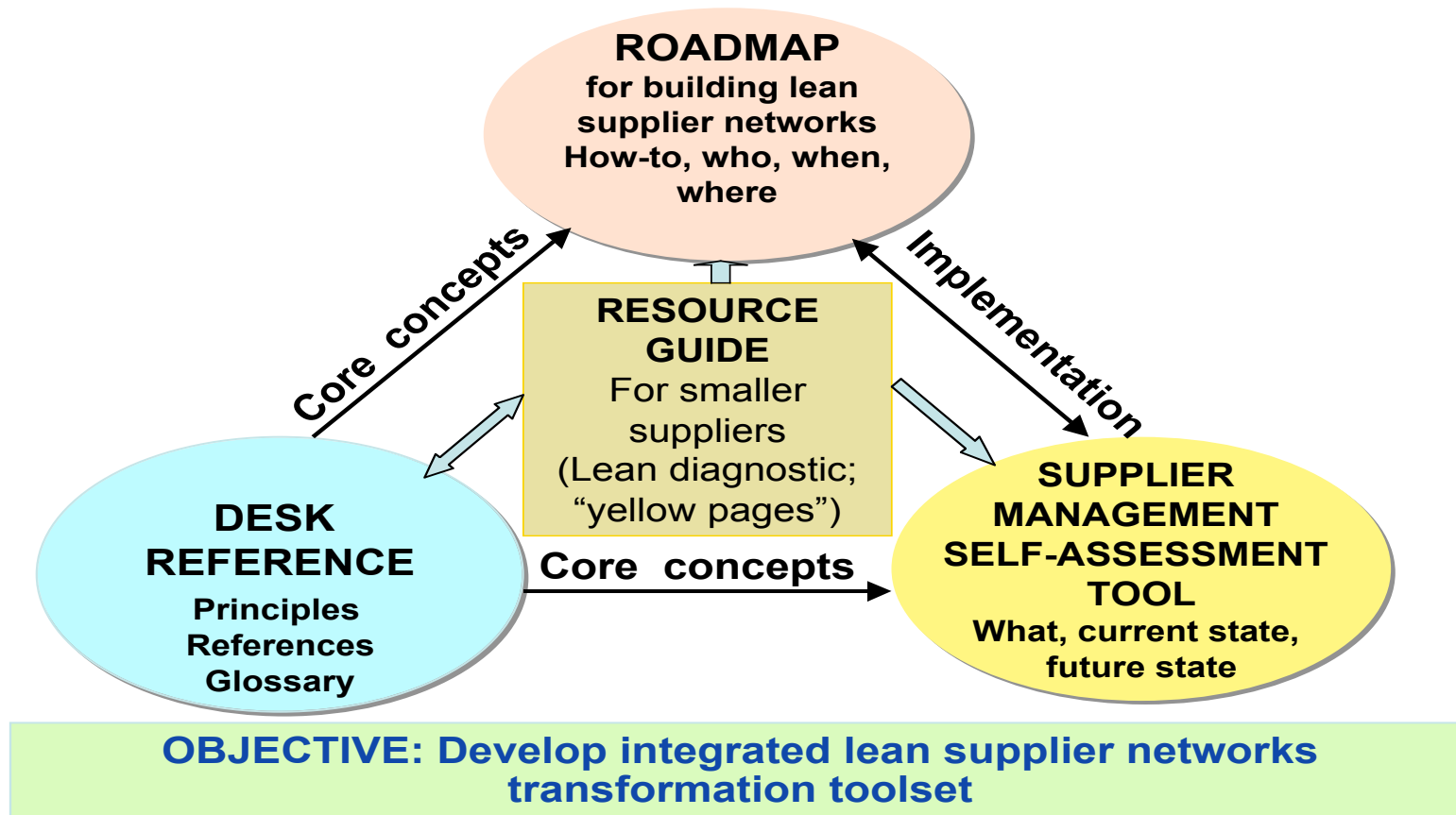
This tool represents the first major module of LAI’s **SUPPLIER NETWORKS TRANSFORMATION TOOLSET (“SUPPLIER TOOLSET”** for short). A second module is the SUPPLIER MANAGEMENT SELF-ASSESSMENT Tool, which presents a framework companies can use to conduct a self-assessment of the “degree of leanness” of their own internal supply chain management capabilities and to identify future improvement opportunities. Both the ROADMAP Tool and the SELF-ASSESSMENT Tool are integrated and should be used jointly. They together make up VERSION 1.0 of the SUPPLIER TOOLSET, which has been developed primarily for use by the primes and major suppliers in the aerospace industry.

SUPPLIER TOOLSET VERSION 1.0 is issued at this time in order to speed up its utilization by aerospace companies. Meanwhile, additional work is under way towards developing two more modules: DESK REFERENCE and RESOURCE GUIDE. The DESK REFERENCE provides a concise compilation of research-based concepts and principles underlying lean supply chain management. The RESOURCE GUIDE, aimed primarily at medium and small size suppliers in early stages of lean implementation, provides a compilation of references to basic lean principles and practices, implementation tools and methods, lean delivery organizations, and related material. These two additional modules will be incorporated into VERSION 2.0 of the SUPPLIER TOOLSET.

FIGURE 1.0 gives an overview of the completed SUPPLIER TOOLSET, encompassing the two major modules making up Version 1.0 and the additional two modules that will be added for Version 2.0.

The SUPPLIER TOOLSET is developed by LAI’s Supplier Networks Working Group. A list of the participants and contributors is provided in APPENDIX A.

**FIGURE 1 – SUPPLIER NETWORKS TRANSFORMATION TOOLSET**



LAI is a unique partnership among many leading US aerospace enterprises, federal government agencies led by the US Air Force, organized labor and MIT. More detailed information about LAI can be obtained from its website: <http://lean.mit.edu>.

## SECTION II -- EXECUTIVE SUMMARY

The ROADMAP TOOL provides a structured process for designing, developing and managing lean supplier networks. The tool is organized around six major building blocks that are linked together in the form of a closed-feedback loop system. These six major building blocks consist of the following:

- 1.0 Define vision
- 2.0 Develop supplier network strategic plan
- 3.0 Establish lean culture and infrastructure
- 4.0 Create and refine lean implementation plan
- 5.0 Implement lean initiatives
- 6.0 Strive for continuous improvement.

Each of these six major building blocks contains a series of specific implementation steps. Both the building blocks and the specific implementation steps associated with each block are presented in FIGURE 2. In addition, a set of “roadmap explorations” are provided for each building block, based on group discussions. The purpose of the “roadmap explorations” discussion is to convey a number of practical considerations identified by the team developing the ROADMAP Tool. These considerations, expected to be of interest to users of the tool, include: inputs required for each building block, expected outputs, barriers to implementation, enablers for overcoming these barriers, metrics, tools and methods, and a series of explorations revolving around questions such as why, what, who, how, where, and when. In each case, various types of tensions likely to arise (i.e., possible negative consequences, reactions, “downsides” and similar tensions) are identified and suggestions are made on how they may be effectively addressed.

As in the “Transitioning to a Lean Environment: A Guide for Leaders” (TTL), which provides a lean transition roadmap at the enterprise level, the major building blocks making up the ROADMAP consist of both “slower-cycle” and “faster-cycle” components. “Slower-cycle” here means the activities are strategic in nature and the metrics used to track them may involve time cycles spanning one or more quarters. “Faster-cycle” means implementation activities involving day-to-day, weekly or monthly execution cycles. The upper-level building blocks (Define vision; develop supplier network strategic plan; establish lean culture and infrastructure) represent the relatively slower-moving-cycle components. They are comparatively more stable than the lower-level building blocks (Create and refine lean implementation plan; implement lean initiatives; strive for continuous improvement). The lower-level blocks move at a relatively faster speed in the sense that the well-known Deming Plan-Do-Check-Act (PDCA) cycle for them is completed and monitored more frequently than that for the upper-level blocks. The terms “slower-cycle” and “faster-cycle,” referring to planning and execution cycles within enterprises, are relative terms and may differ for different organizations.

There is an on-going feedback loop connecting the lower-level building blocks, as lean implementation plans are created and refined, lean implementation initiatives are executed, and continuous improvement programs are monitored and carried out to achieve established performance metrics. As a result of the performance results, the strategic plan is re-calibrated, as

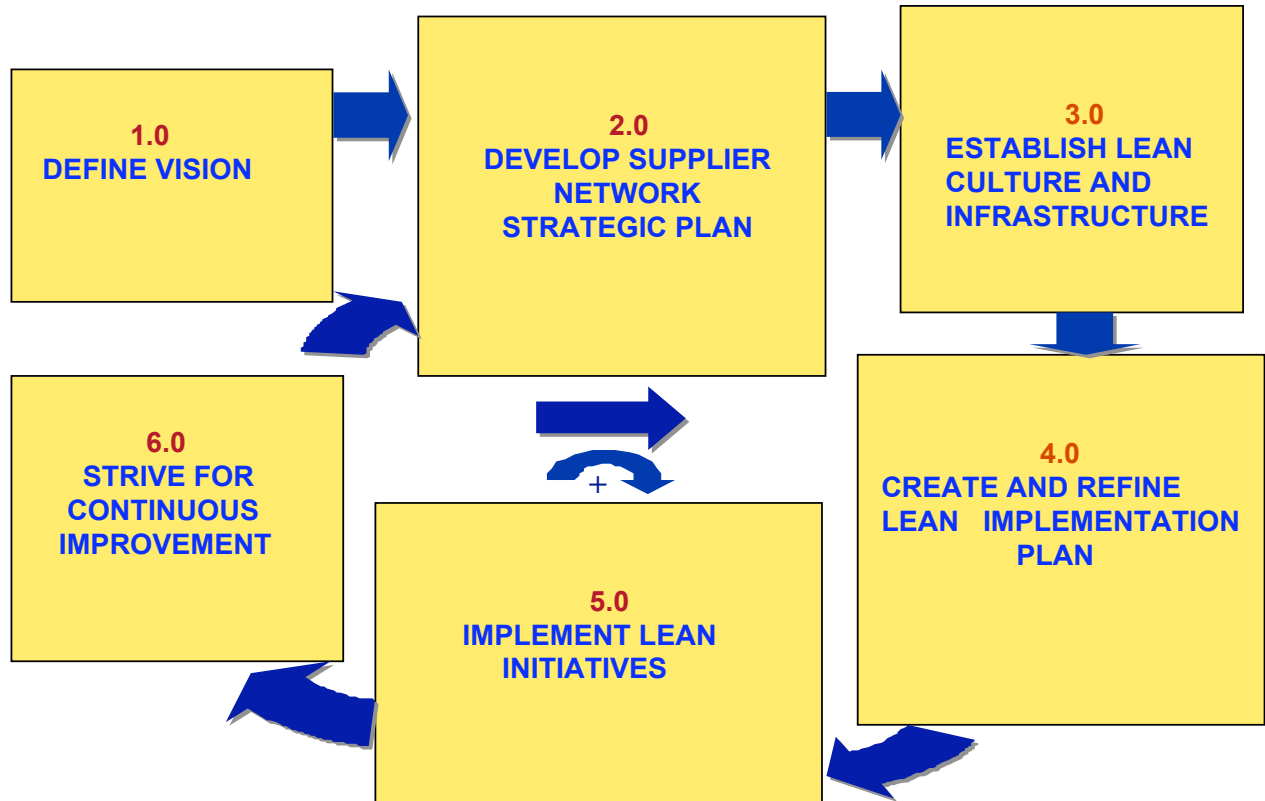
necessary, on an on-going basis. These performance results may also be used periodically to help modify the vision definition, as appropriate.

The ROADMAP was not created as a stand-alone tool; it is, in fact, firmly embedded in enterprise-level lean transition plans and actions as outlined in the TTL document (also referred to as the “Transition to Lean Model”). As such, definition of the enterprise’s vision guiding supply chain management activities, the enterprise’s business model, development of the supply chain strategic plan, and creation of the necessary lean infrastructure are accomplished through close coordination of supply chain management activities throughout the enterprise. The development and execution of the ROADMAP for building lean supplier networks takes the whole enterprise.

The ROADMAP was developed to meet the needs of enterprises just starting to evolve lean supply chain management capabilities as well as those of companies that are well along in their lean journey. As detailed below, one of the implementation steps in Block 2.0 – Develop Strategic Plan calls for self-assessment using the SUPPLIER MANAGEMENT SELF-ASSESSMENT Tool. This would enable an enterprise to define its current state in the domain of lean supply chain management. It is expected, using the tool, that a future state would also be defined (at least on a provisional basis), reflecting the enterprise’s performance improvement goals and objectives. Having thus defined its “as-is” and “to-be” states, an enterprise can then proceed to implement the strategic, tactical and operational steps laid out in the rest of the ROADMAP, within each of the linked blocks.

The ROADMAP was constructed after careful review of transformational change initiatives in many aerospace companies documented in the course of developing the TTL Model. One of the key lessons-learned was that those enterprises that skip the upper-level blocks that require an enterprise-level systems perspective and instead concentrate directly or solely on lean implementation in one or more of the lower-level blocks often run into considerable implementation difficulties. Two main reasons can be cited for these difficulties. The first is that the full benefits of lean implementation are frequently not realized because one or more of the key enablers of lean implementation are ignored or overlooked. The second reason is that isolated lean implementation, that may result in local optimization or islands of success, does not lead to global (enterprise-wide) optimization for lack of a systems view of the enterprise transformation process. This is not to suggest that enterprises should follow, in a lockstep fashion, the various ROADMAP blocks as outlined here. But it is strongly suggested that enterprises striving to build lean supplier networks should consider the action steps encompassed in these building blocks and the order in which they might best be executed.

**FIGURE 2 – ROADMAP: MAJOR BUILDING BLOCKS**



## SECTION III – MAJOR BUILDING BLOCKS

This section presents a description of each of the major building blocks, provides a summary description of the specific implementation steps within each block, and outlines a set of practical considerations of interest to users of the tool.

### 1.0 DEFINE VISION

**Description:** Define the attributes of a lean supplier network that would ensure the efficient creation of value for multiple enterprise stakeholders by enabling the enterprise to provide products and services to market in shorter times, with high quality, best value, increased performance, and greater customer satisfaction. The vision of the supplier network represents a direct extension of the corporate vision, goals and objectives. The size, structure and composition of the supplier network are governed by the enterprise's defined vision and business model. They drive enterprise-wide strategic initiatives, which must be shared throughout the supplier network. The vision statement and the business model reflect the enterprise's view of its portfolio of core competencies and how it proposes to align core competencies throughout the supplier value stream. Ultimately, the enterprise's supplier vision represents, in itself, a central core competence to enhance the enterprise's competitive advantage.

#### Key considerations:

- Are you and your enterprise's top management sufficiently familiar with basic Lean Thinking and Six Sigma concepts governing the design and management of supplier networks?
- Do you have an explicitly defined enterprise vision and business model guiding your supply chain design and management strategies and activities?
- Is your top management committed to adoption of lean principles?
- Do you have a well-defined, robust value proposition with your key suppliers spelling out mutual expectations concerning value exchanges? Is your value proposition differentiated for different categories of suppliers?
- How would you evaluate the degree of integration between your supply chain design and management activities across your enterprise and your enterprise-wide lean transition initiatives [say, on a scale of zero (poor) to five (excellent)].
- Where is your enterprise on its lean journey (i.e., at what level of transition is your enterprise at this time)? You may want to consult the results of your enterprise's use of the Lean Enterprise Self-Assessment Tool (LESAT). Do you have hard evidence supporting your conclusions?

### 2.0 DEVELOP SUPPLIER NETWORK STRATEGIC PLAN

**Definition:** The strategic plan should identify the current state of the supplier network, define a desired future state, and provide a recommended course of action to achieve the development of a lean supplier network. It should identify the improvement opportunities, barriers, and costs and benefits associated with the implementation of the strategic plan. The plan should identify a single point of contact for its achievement and the individual(s) with the organizational responsibility and resources to accomplish the specific elements of the plan within budgetary constraints.



***Key considerations:***

- Do you have a structured process for linking your enterprise’s vision and business model to your strategic planning of your supplier network design and management activities?
- Do you have a working familiarity with strategic lean concepts and practices governing lean supply chain design, development and management?
- Do you know the *current state* of your internal lean supply chain management capabilities? Do you know the *current state* of the degree of leanness of your key suppliers?
- Do you have a clear understanding of the *desired future state* for your internal supply chain management capabilities, as well as of the *desired future state* of your supplier network in terms of its degree of leanness?
- In defining the *desired future state*, have you considered your enterprise’s strategic make-buy criteria, key value-creating processes across your enterprise value stream, your enterprise’s future need in terms of required core competencies, and how best to optimize these core competencies across your supplier network?

### **3.0 ESTABLISH LEAN CULTURE AND INFRASTRUCTURE**

**Definition:** Create the lean culture and develop the infrastructure necessary for implementing lean principles and practices to evolve lean supplier networks. This task involves the establishment of physical systems (e.g., information technologies and systems, facilities, equipment), organizational structures, lean behavior (e.g., relationships, incentive systems), and development of support systems (e.g., training materials, tools and methods). It is necessary to establish the conditions conducive to lean transformation of the supplier network. Lean principles and practices must be learned and internalized. Mass production principles and practices must be abandoned. Incentives must be rationalized to foster the new lean culture in the enterprise. Processes and practices, driven by lean behavior, should drive change, leading to concrete performance improvements. Establishing lean culture and infrastructure is critical for putting “muscle” behind the creation and implementation of lean initiatives aimed at transforming the enterprise’s supplier network.

***Key considerations:***

- Are you committed to making the necessary investments in terms of infrastructure, training and education to develop the necessary lean supply chain management culture, structures and tools?
- Have you aligned critical processes and procedures across your enterprise, as well as between your enterprise and your supplier network?
- Is your enterprise ready for doing business in the Internet age, at Internet speed, with your suppliers? Have you ensured that your lower-tier suppliers, as well, are linked electronically to your key suppliers to ensure visibility and responsiveness throughout your supplier network?
- Do you have the right incentives and reward systems both internally and across your supplier network to make sure that the entire network (including your enterprise) operates as efficiently and effectively as possible so that your enterprise can create and deliver value to your multiple stakeholders?

#### 4.0 CREATE AND REFINE LEAN IMPLEMENTATION PLAN

**Description:** This block of activities represents the beginning of translating the organization’s supplier network lean vision and strategies developed earlier into reality. The previous block set the stage by developing the IT/IS infrastructure, organizational structures, incentives mechanisms, and technical and business processes necessary for implementing the tasks ahead. This block of activities entails the creation and refinement of lean implementation activities. Necessary steps include supplier value stream mapping and analysis, the identification and prioritization of lean implementation initiatives to bridge the “gap” between the “current state” and the desired “future state,” the deployment-ready development of implementation tools and methods as well as the provision of the needed training programs, and the commitment of resources for implementation. Here, suppliers are segmented into categories based on strategic criteria, and differentiated supply chain management approaches are defined to minimize transaction costs and maximizing value creation. Where appropriate, joint lean deployment plans are developed with key suppliers. Information is shared with suppliers regarding costs, risks, and potential gains, as well as how to incentivize suppliers to continuously drive down cost while enhancing value delivered to the end-user or customer. Strategic supplier relationships and alliances are defined. Concrete procurement plans are developed, including Internet-enabled procurement of parts and materials. The lean toolset is developed and/or assembled to meet the needs of the next block of actual implementation of lean initiatives.

This block starts the beginning of the “short term cycle,” which is best represented as “annual operating plans” (AOPs) by most aerospace companies. In fact, this block of activities can serve as the cornerstone of the enterprise-level AOPs. There are strong tactical relationships between the activities in this block and those in the enterprise-level TTL block of activities (i.e., Create and Refine Implementation Program; Implement Lean Initiatives).

It is important to underscore the importance of developing a comprehensive implementation plan that addresses *all* of the overarching (and related enabling) practices identified in the SUPPLIER MANAGEMENT SELF-ASSESSMENT Tool:

- 1.0 Design supplier network architecture
- 2.0 Develop complementary supplier capabilities
- 3.0 Create flow and pull throughout the supplier network
- 4.0 Establish cooperative relationships and effective coordination mechanisms
- 5.0 Maximize flexibility and responsiveness
- 6.0 Pursue supplier-integrated product and process development
- 7.0 Integrate knowledge and foster innovation
- 8.0 Demonstrate continuous performance improvement.

#### ***Key considerations:***

- Have you established structured processes internally to evolve integrated improvement action plans in cooperation with the product development, manufacturing, quality improvement and other major processes and process owners across the enterprise?

- Does your tactical implementation plan consider all of the overarching and enabling practices outlined in the SUPPLIER MANAGEMENT SELF-ASSESSMENT Tool and how these practices would shape your specific processes, functions and activities across the enterprise?
- Have you developed a system of metrics for developing your internal supply chain management capabilities as well as for evolving a lean supplier network?
- Are you familiar with value stream mapping concepts and techniques?
- Have you given explicit attention to the development of the required educational and training materials and initiatives?
- Have you developed the necessary implementation tools?

## 5.0 IMPLEMENT LEAN INITIATIVES

**Description:** This block of activities encompasses specific strategies, steps, actions and events that are undertaken to implement the plan developed earlier. The implementation activities span all actions across the extended enterprise (i.e., both internally and across the supplier network) aimed at developing the required capabilities and integrating the supplier network in order to achieve the enterprise-level vision and strategic objectives, supported by the lean infrastructure system. The implementation of the plan embraces the coordination, synchronization and integration of all engineering, manufacturing and assembly, subcontracting, procurement, material and quality functions, and further includes off-site manufacturing support, contract manufacturing, third-party logistics and customer support functions.

The implementation activities must be governed by the overarching (and related enabling) practices identified in the SUPPLIER MANAGEMENT SELF-ASSESSMENT Tool. All of these practices show the path forward in terms of how to improve existing processes, functions and activities. It may be helpful to map out the interactions between the planned implementation activities (and the processes and functions they are designed to improve) *and* the various overarching (and related enabling) practices. This will help ensure that the specific implementation activities are driven by the overarching (and related enabling) practices. For example, such a mapping exercise might readily demonstrate that much of the existing supplier development activities concentrate on one or two of the eight overarching practices and largely omit the rest. For instance, too little emphasis might be placed on pursuing supplier-integrated product and process development, or on maximizing the flexibility and responsiveness of the supplier network, or on integrating knowledge and fostering innovation across the supplier network.

Typically, not enough resources are available for reaching most of the enterprise's suppliers and some hard, informed, choices must be made. To allocate the available scarce resources effectively, a two-step process may be adopted, for example, in supplier development. The first might entail a quick audit of supplier capabilities. This may involve web-based or paper-based assessments, based on questionnaire surveys. They may also involve site-visits, following the completion of such questionnaire surveys and a review of output reports. The questionnaire surveys -- in addition to helping to develop an informative profile of the supplier's capabilities -- can be designed to flag certain issues, inconsistencies, and improvement opportunities. The second step might then involve more resource-intensive activities focusing on selected suppliers. These activities might involve supplier qualification or certification, training and development, and kaizen events.

In implementing lean initiatives internally within the enterprise, senior managers must be both committed and must lead. They must help remove barriers and facilitate the deployment of enablers. They must ensure the participation of all people who can make a contribution to the needed change process. Communication is critical in this process. It is important to identify, demonstrate and reinforce results visibly throughout the organization. Rewards should be provided to recognize both individual and team performance towards achieving the established metrics. Conflicts between “old” and “new” ways of doing business must be managed. Constancy of intent and purpose must be communicated widely and consistently to discourage skepticism and to fend off uncooperative behavior reflecting the misplaced feeling that the lean change process is yet another “flavor-of-the-month” initiative.

**Key considerations:**

- Do you have in place a comprehensive set of prioritized improvement initiatives driven by the overarching (and related enabling) practices governing lean supply chain management? Are these initiatives fully integrated with the priorities of the product development, manufacturing and other groups within the enterprise?
- Have you established specific lean implementation teams, timelines, milestones and outcome measures?
- Is there a shared understanding of the various lean implementation initiatives across the respective deployment teams? Are the implementation initiatives clearly communicated to the affected suppliers? Are those suppliers fully “on board” on these initiatives?
- Have you anticipated the various barriers that may impede the various lean implementation initiatives? Are there mitigating courses of action in place for overcoming such barriers?

## **6.0 STRIVE FOR CONTINUOUS IMPROVEMENT**

**Description:** This block of activities involve the application of systems, practices, methods and tools for on-going monitoring, measurement and assessment of progress being made by the enterprise on its lean journey toward the development of lean supplier networks. The focus here is on performance by both internal operating entities and by external suppliers, to ensure continuous learning, adaptation and improvement enabling the creation of value for multiple enterprise stakeholders, by delivering best lifecycle value to the customer. Beyond relatively routine on-going tasks involving the measurement of how well the enterprise is performing toward meeting its stated vision, objectives and performance metrics, an essential task entails the capturing, adoption and sharing of new knowledge and “lessons learned” throughout the supplier network. A critical task involves continuous nurturing of a virtuous cycle of learning and improvement throughout the supplier network and the institutionalization of a continuous process of prime-supplier performance improvement.

**Key considerations:**

- Do you have a structured process in place for evaluating results against future state goals and metrics on an on-going basis?
- Does this structured process enable you to identify opportunities for continuous improvement across the extended enterprise (your enterprise plus the entire supplier network)?

- Do you have in place a proactive process for nurturing continuous improvement throughout the extended enterprise?
- Do you communicate needed changes in your enterprise's vision, strategy and support infrastructure based on your continuous improvement activities?
- Do you on a regular basis modify and refine your tactical implementation plan and activities as a result of lessons learned in the course of your continuous improvement activities?
  - Do you capture, adopt and rapidly communicate new knowledge gained through your continuous improvement activities throughout your supplier network?

## SECTION IV – IMPLEMENTATION STEPS AND ROADMAP EXPLORATIONS

This section of the ROADMAP describes the specific implementation steps for each of the six major building blocks. In addition, a set of “roadmap explorations” are provided for each building block, based on group discussions. The purpose of the “roadmap explorations” discussion is to convey a number of practical considerations identified by the team developing the ROADMAP Tool. The “roadmap explorations highlight the following topics that would be of interest to users of this tool: the inputs required for each building block, expected outputs, barriers to implementation, enablers for overcoming these barriers, metrics, tools and methods that may be useful, and a series of explorations revolving around questions such as why, what, who, how, where, and when.

Before proceeding with a description of the specific implementation steps associated with each building block, “roadmap explorations” can be quickly summarized as follows.

- **Inputs** – What are the principal inputs (e.g., information, decisions, actions) from earlier blocks or other parts of the enterprise for performing the tasks encompassed within a given block?
- **Outputs** – What are the principal outputs (e.g., information, actions, achievements) resulting from having performed the activities within a given block?
- **Barriers** – What are the key barriers that can be expected in implementing the activities within each block?
- **Enablers** – What are the enablers that can be used to overcome these barriers?
- **Metrics** – What types of potential metrics can be used to gauge progress in performing the defined activities within each block, as well as to motivate individuals, teams and organizations not only “to do the right thing” but also “to do it right.”
- **Tools and Methods** – What types of tools, methods and techniques can be used in performing the tasks within each block?
- **Explorations** – Why are we doing the activities within a given block? What precisely are we expected to do? Who is (are) expected to perform these activities? How are these tasks to be performed? Where are they to be performed? When are they to be performed? In each case, what types of tensions are likely to arise (i.e., possible negative consequences, reactions, “downsides” and similar tensions that may arise so that they can be anticipated and effectively addressed)?

These Roadmap Explorations are offered to users of this tool in the expectation that the material presented here may be of some practical value. They are presented in a slighted edited form, but they are also intended to convey some of the “raw” discussion points as they originally came up in the group discussions in order not to lose the sense of urgency or importance attached to them.

### 1.0 DEFINE VISION

#### *Implementation Steps:*

- 1.1 **Develop knowledge of basic lean supply chain design and management principles** – An important first step in evolving lean supplier networks is to be acquainted with basic lean

concepts, principles and practices related to designing, developing and managing lean supplier networks. A good place to start is the LAI website for publications, working papers, presentations and theses. This material will be organized into the DESK REFERENCE, mentioned earlier, that will be integrated as a new module into the SUPPLIER TOOLSET.

**1.2 Define enterprise vision and business model linked to supplier integration** – The enterprise’s vision, and its translation into the enterprise’s business model, represent a new mental model of how the enterprise would function if it acts and behaves according to lean principles and practices. Such a vision, and the accompanying business model, must extend to all aspects of the enterprise and must represent an integral part of its business plan at all levels. Thus, the enterprise’s vision, and its business model, for supplier integration reflect a number of core values and value creation strategies which shape how the enterprise, as a corporate entity, views its supplier network. Three basic “core values” can be identified: network-wide thinking, network-wide mutual trust and commitment, and sustained creation of best value for multiple stakeholders. These core values and related key principles are discussed in the DESK REFERENCE. For a quick reference, also consult the SUPPLIER MANAGEMENT SELF-ASSESSMENT TOOL (Version 1.0) – particularly the Level 5 lean attributes defining “1.0 Design Supplier Network Architecture.” The strategic directions underlying the enterprise’s supplier integration activities must be shared, commonly understood and supported throughout the supplier network.

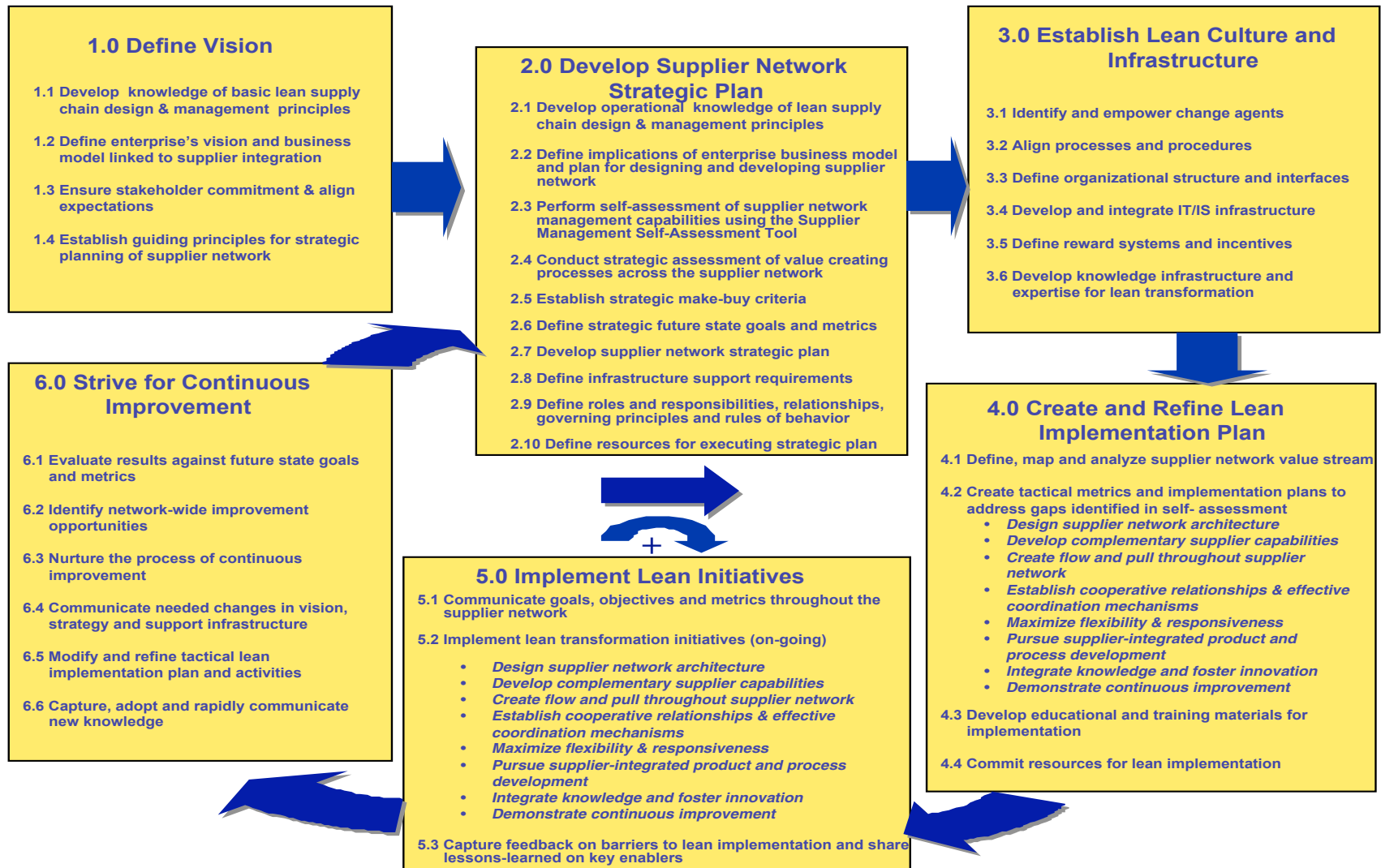
**1.3 Ensure stakeholder commitment and align expectations** – Refer to Earll Murman, et al., *Lean Enterprise Value: Insights from MIT’s Lean Aerospace Initiative* (Houndmills, United Kingdom: Palgrave, 2002) for a discussion of the enterprise value creation framework. It is argued here that “value creation is the cornerstone of a successful enterprise” (p.182). The value creation framework has three interrelated phases: value identification, value proposition, and value creation. In the past, most value stream mapping and analysis tools for enterprise improvement, as well as for supplier development, have typically focused on the “value creation” phase, largely ignoring the earlier phases that are crucially important. Also, in the past, much of the discussion on value creation has focused on the “customer”, concerned with delivery of value to the “customer”. Efforts have been under way in recent years within the LAI at MIT to elevate lean thinking to the total enterprise, comprising the *extended enterprise* and encompassing, of course, the supplier network. In parallel, consideration of enterprise stakeholders has been expanded to include not only the customer (end-user) but also other stakeholders, such as the workforce, suppliers, shareholders, and society. The enterprise itself, as a corporate entity, is an important stakeholder. The general point here is that at the very outset it is necessary for the enterprise to identify its supplier stakeholders, specify their value expectations, align these expectations, and ensure their commitment to the defined enterprise vision.

**1.4 Establish guiding principles for strategic planning of supplier network** – Supplier strategy is seen as a central core competence to enhance corporate competitive advantage through efficient creation of value for multiple stakeholders (including suppliers). This can be accomplished through striving to optimize the portfolio of core competencies internally and throughout the supplier network. Consequently, the supplier network must be designed proactively and supplier strategy must be deliberately architected to achieve the enterprise’s

vision, goals and objectives. A necessary step in this direction is the recognition that the supplier network design, as well as strategy, reflects a proactive and comprehensive strategic mapping of current and required core competencies internally and across the supplier network. These considerations serve as guiding principles for strategic planning of the supplier network.



**FIGURE 2 – ROADMAP: MAJOR BUILDING BLOCKS AND SPECIFIC IMPLEMENTATION STEPS**



**Roadmap Explorations – Part A (Block 1.0 Define Vision): Inputs, Outputs, Barriers, Enablers, Metrics, Tools and Methods**

Inputs	Outputs
<ul style="list-style-type: none"> <li>• Flowdown of the enterprise vision (e.g., from the TTL Guide).</li> <li>• Enterprise goals for supply chain activities (e.g., cycle-time-to-market; cost-to-market; quality) that are customer-derived and competition-driven.</li> <li>• Stakeholder inputs.</li> </ul>	<ul style="list-style-type: none"> <li>• Vision of future state, consisting of a vision statement describing where the enterprise would like to be in the future, compared with an assessment of the current state indicating where the enterprise is today.</li> </ul>
Barriers	Enablers
<ul style="list-style-type: none"> <li>• Lack of supplier involvement.</li> <li>• Lack of trust.</li> <li>• Lack of management commitment.</li> <li>• Resources (money, time, people).</li> <li>• Fear.</li> <li>• Lack of knowledge.</li> <li>• Lack of processes (organizational, business, change processes)</li> <li>• Attitude.</li> <li>• Lack of long-term commitment.</li> <li>• Lack of enterprise long-range vision, business model or plan.</li> </ul>	<ul style="list-style-type: none"> <li>• Obtain inputs from key suppliers.</li> <li>• Initiate trust-building steps with suppliers to overcome potential resistance.</li> <li>• Obtain top-level management commitment and allocation of the necessary resources.</li> <li>• Develop and share the requisite knowledge on lean principles.</li> <li>• Stress transparency and clearly communicate goals and vision to overcome fear and “not invented here” attitude</li> <li>• Emphasize long-term goals, vision, business model and communicate their importance.</li> </ul>
Metrics	Tools and Methods
<ul style="list-style-type: none"> <li>• Focus on the degree of integration with enterprise-level lean transition initiatives and activities. Determine where your enterprise is on its lean journey (e.g., using the LESAT).</li> </ul>	<ul style="list-style-type: none"> <li>• Educational material for enterprise leadership related to basic concepts and benefits of building lean supply chain design and management; business case (costs and benefits)</li> <li>• Benchmarking results; outside consultants; Supplier Advisory Council.</li> <li>• Implementation tools developed by LAI.</li> </ul>

**Roadmap Explorations—Part B (Block 1.0 Define Vision): Why, What, Who, How, Where, When**

<b>Why</b>	<b>Tensions</b>
<ul style="list-style-type: none"> <li>• Establish common direction and goal -- Make sure that the vision, goals and objectives driving supply chain management is an integral part of the enterprise’s vision, goals and objectives.</li> <li>• Provides foundation for your strategic plan -- Ensure that the size, structure and composition of the supplier network reflects the enterprise’s vision and make-buy strategy; further ensure that the design of the supplier network reflects a proactive effort to balance in-house capabilities with supplier-based core competencies.</li> <li>• Creates shared purpose (internal and external to the core enterprise) -- Communicate a consistent vision throughout the supplier network; adopt a lean perspective on supply chain management, make sure to communicate the vision that supply chain management is a lot more than minimizing transaction costs – it is about creating best lifecycle value for enterprise stakeholders.</li> </ul>	<ul style="list-style-type: none"> <li>⇒ <i>Does this mean the enterprise had no vision beforehand, or that it just was not good enough?</i></li> <li>⇒ <i>Why do we need a vision? How about just slightly modifying the current vision?</i></li> <li>⇒ <i>What about the link between the new vision and the need for changing the existing culture? It may be pointless defining a new vision when the existing culture itself may be so entrenched that all we will have is a paper vision.</i></li> <li>⇒ <i>This may limit daringness.</i></li> <li>⇒ <i>This could constrain entrepreneurial risk taking.</i></li> <li>⇒ <i>There may arise both internal and external conflicts between the enterprise’s new vision and the current culture.</i></li> </ul>
<b>What</b>	<b>Tensions</b>
<ul style="list-style-type: none"> <li>• Desired direction and future state -- Define and build a shared vision of what the enterprise’s supply chain management capabilities would look like if it adopted lean principles.</li> <li>• Motivates people -- The vision, goals and objectives should be explicit and clear.</li> <li>• Promotes goal alignment.</li> <li>• Represents the value proposition.</li> </ul>	<ul style="list-style-type: none"> <li>⇒ <i>Can polarize the organization.</i></li> <li>⇒ <i>Can act as a lightning rod for naysayers.</i></li> <li>⇒ <i>Keep in mind that having defined the vision, goals and objectives driving supply chain management is just the beginning of the road – one has to follow-through and make it happen.</i></li> <li>⇒ <i>How explicit or detailed should the vision be?</i></li> <li>⇒ <i>You can’t impose a vision on many independent companies making up the supplier network. How do we make sure that they buy into such a vision and work together to make it happen?</i></li> </ul>

<b>Who</b>	<b>Tensions</b>
<ul style="list-style-type: none"> <li>• Enterprise leadership in collaboration with stakeholders—supply chain design and management involves the whole enterprise. It would be a serious mistake to act narrowly and delegate this responsibility to the traditional procurement or purchasing department.</li> <li>• Outside help (consultants).</li> <li>• Supplier stakeholders should be involved.</li> </ul>	<ul style="list-style-type: none"> <li>⇒ <i>Some people may be left out -- How do you decide who should be involved in crafting the enterprise's vision, goals and objectives pertaining to supply chain management?</i></li> <li>⇒ <i>Ideas left unheeded may create unwanted resentment.</i></li> <li>⇒ <i>This may result in possible leadership disruption or disruption of organizational change process.</i></li> <li>⇒ <i>How do you obtain the support of those who are not asked to participate in this process?</i></li> <li>⇒ <i>Should we seek a consensus? How do we deal with possible conflicts among the views of the various participants?</i></li> </ul>
<b>How</b>	<b>Tensions</b>
<ul style="list-style-type: none"> <li>• Learn -- Consult lean principles and practices; read the pertinent lean literature on transforming supplier networks.</li> <li>• Consider inputs from stakeholders.</li> <li>• Align mutual expectations.</li> <li>• Visit successful companies.</li> <li>• Attend workshops, seminars and conferences (e.g., organized by LAI)</li> <li>• Institute a participatory process seeking the active engagement of the key stakeholders across the extended enterprise.</li> </ul>	<ul style="list-style-type: none"> <li>⇒ <i>How do you define participation?</i></li> <li>⇒ <i>How do you avoid insular vision?</i></li> <li>⇒ <i>How do you avoid a "too detailed" or "too vague" definition of the enterprise's vision?</i></li> <li>⇒ <i>How do you make sure that the enterprise's vision can be achieved (e.g., by applying successful practices observed elsewhere)?</i></li> <li>⇒ <i>How do you overcome the "not invented here" type of resistance to new ideas?</i></li> <li>⇒ <i>Is the "how" question really separable from the "who" question?</i></li> </ul>
<b>Where</b>	<b>Tensions</b>
<ul style="list-style-type: none"> <li>• Enterprise-wide; across the various functional, process and program groups/entities</li> <li>• Integration with enterprise vision requires engagement at the top enterprise leadership level.</li> <li>• Both top-down and bottom-up participation required to achieving an internally-consistent set of goals and objectives means multi-level inputs within the enterprise</li> </ul>	<ul style="list-style-type: none"> <li>⇒ <i>What do you do if there are incompatible domain specific visions generated along the way?</i></li> <li>⇒ <i>How is the vision translated into metrics and actions at different levels?</i></li> <li>⇒ <i>How do you make sure that the vision, in reality, does not get narrowly relegated to the procurement or purchasing department and everybody else's presumed responsibility in achieving it soon becomes forgotten?</i></li> </ul>

When	Tensions
<ul style="list-style-type: none"> <li>• The first step in striving to transform the supplier base; after adopting the lean paradigm at the enterprise and prior to strategic planning.</li> <li>• Progressively refined -- An iterative process where the enterprise's strategic vision, goals and objectives shape, and are shaped by, the vision, goals and objectives driving the design and management of the supplier network.</li> <li>• Not a "one-time-only" step; periodically re-visited and modified, as appropriate, based on the actual enterprise progress made in light of changing external conditions, threats and opportunities.</li> </ul>	<ul style="list-style-type: none"> <li>⇒ <i>Competing priorities may get in the way.</i></li> <li>⇒ <i>Limited lean exposure, knowledge or experience --How can you develop a lean vision, as well as goals and objectives, governing the enterprise's supply chain management strategies and actions when there has been little prior lean experience? Doesn't this represent a big "leap of faith"?</i></li> <li>⇒ <i>How often should the vision, goals and objectives be reviewed and modified without creating a mountain of metrics and paperwork?</i></li> <li>⇒ <i>How do you allow for an evolutionary process of lean learning and implementation? Isn't there a risk of jumping too fast, only to falter and then blame "lean" for failing to make the desired progress?</i></li> </ul>

## 2.0 DEVELOP SUPPLIER NETWORK STRATEGIC PLAN

### Implementation Steps:

#### 2.1 Develop operational knowledge of lean supply chain design and management principles

– Lean principles and practices guiding supply chain design, development and management differ fundamentally from traditional “mass-production” oriented concepts, processes and activities. It is therefore important to develop a working familiarity with the intellectual underpinnings of lean thinking applied to supplier networks and lean supply chain management principles and practices. Such a knowledge base can be gained through education, reading, benchmarking and conferences. The DESK REFERENCE provides such an orientation. The Lean Enterprise Model (LEM), developed earlier by the LAI, may also be consulted for specific practices. In addition, the LAI website (<http://lean.mit.edu/>) contains a considerable amount of archival material that can be used. These include summaries of numerous research results, as well as presentations in many workshops focusing on implementation issues.

#### 2.2 Define implications of enterprise business model and plan for designing and developing supplier network

– The enterprise’s business model maps out the strategic framework for creating value for its multiple stakeholders. This starts with a structured “sense-making” or “enterprise sensor” activities to detect important impending external shifts (e.g., markets, technology, institutional environment) and to identify new value creation opportunities. The results serve several useful purposes: the identification of the enterprise’s stakeholders and their values, construction of robust value propositions, and definition of efficient as well as effective value creation strategies. The enterprise’s vision, goals and objectives represent clear articulation and communication of its business model. In task of designing, developing and managing lean supplier networks must be firmly linked to the enterprise’s business model and the business plan it has developed to execute that business model.

Let us consider, for example, the proposition that today’s emerging networked enterprises represent complex adaptive systems that must operate successfully in a fluid, rapidly changing, network-centric, system-of-systems environment. Defense aerospace enterprises, for instance, are rapidly outgrowing their traditional platform-oriented focus to operate more effectively in a system-of-systems environment introducing far more technological complexity and significantly greater interface management challenges. Competition between traditional “industrial age” enterprises is being replaced by competition between networks of enterprises. At the same time, asset-based competition is being replaced by knowledge-based competition. Information revolution is completely redefining interactions among enterprises and their boundaries. Networked virtual enterprises will be the rule, not the exception, in the future. Minimizing transaction costs will be replaced by collaboration, learning and innovation. The networked enterprises of the future must exhibit agility, flexibility and responsiveness. The general point here is that enterprises are highly unlikely to succeed on a sustained basis if they neglect to integrate these types of considerations into the process of designing, developing and managing their supplier networks.

**2.3 Perform self-assessment of supplier network management capabilities using the SUPPLIER MANAGEMENT SELF-ASSESSMENT TOOL** – This step calls for conducting a self-assessment of the enterprise’s supply chain management capabilities to define the “current state” and, in doing so, to identify targets of opportunity for making further improvements. The SELF-ASSESSMENT TOOL has been designed for this purpose. To obtain the best results, it is recommended that interested enterprises consider the following sequence of implementation steps which link together the use of the SELF-ASSESSMENT TOOL and the ROADMAP, as well as with enterprise-level implementation tools developed by the LAI.

**STEP 1:** Determine overall lean progress of the entire enterprise -- Use the LESAT for this task. If you are not familiar with LESAT, you can access it on the LAI website (<http://lean.mit.edu>). In particular, identify the top-level scoring attached to supply chain management activities at the enterprise level. Refer to LESAT, or to Appendix B of the SELF-ASSESSMENT TOOL to see how the overarching and enabling practices outlined in that document, governing lean supply chain management activities, are “rolled-up” to the enterprise level. Expected result: Status check on how much progress the enterprise as a whole has made along its lean journey.

**STEP 2:** Determine the status of the enterprise’s lean transformation activities -- Use the TTL Model to find out how the enterprise is executing its lean transformation across-the-board. Identify the points where the task of evolving lean supplier networks tie in with the enterprise’s lean transformation activities. Remember that the SUPPLIER TOOLSET – including both the ROADMAP Tool and the SELF-ASSESSMENT Tool – is designed to transform the enterprise’s “supplier networks” domain. Expected result: Status check on the enterprise’s across-the-board lean transformation activities, in order to identify the points of connection (“hand-off” points) where the SUPPLIER TOOLSET can take over in order to build lean supplier networks.

**STEP 3:** Conduct the self-assessment task required under this particular implementation step. Use the SELF-ASSESSMENT Tool to conduct an internal assessment of supply chain management capabilities. The results of this self-assessment process should yield a determination of the “gap” between the current (“as-is”) and desired future (“to-be”) states, identification of improvement opportunities, and prioritization of improvement steps. These results will represent inputs into the ROADMAP implementation effort; so, the rest of the specific building blocks and implementation steps outlined here, in the ROADMAP Tool, can be pursued to help define the “desired future state” and to bridge the gap between the “current state” and the desired “future state.”

Typically, the type of self-assessment just described is automatically followed by a determination of desired future states, defining performance targets to be achieved. A cautionary note should be introduced at this point. It is argued that before the “desired future state” is defined for each of the overarching lean practices for supply chain management, it is necessary to perform two intermediate tasks: (a) conduct a strategic assessment of value creating processes across the supplier network; and (b) establish strategic make-buy criteria linked to the enterprise’s core competencies. Otherwise, the resulting “desired future”

definitions or performance targets would run the risk of being essentially tactical steps that may lead to less than optimal results.

#### **2.4 Conduct strategic assessment of value creating processes across the supplier network --**

A strategic understanding of value creation processes, both internally and across the supplier network, is an important early step in developing the strategic plan. The type of thinking required here differs from that driving the well-established method of value stream mapping and analysis, which is primarily geared to the identification and elimination of waste throughout the supplier value stream. It may be helpful to think about the task at hand in terms of: (a) defining stakeholder value expectations, focusing on the customer; and prioritizing these expectations; (b) identifying essential enterprise processes and technologies, both internally and across the supplier network, that create value or could be better synchronized to meet these expectations more efficiently and effectively; (c) mapping the stakeholder value expectations against the processes and technologies, to assess their goodness of fit; and (d) assessing how the key processes and technologies can better support each other, thus identifying new and improved ways of where and how greater value can be created for the stakeholders. The focus here is not on individual suppliers but on mapping processes and technologies, internally and across the suppliers, in order to design an improved portfolio of value-creating capabilities. The expected result is a strategic roadmap of how the enterprise is creating value to meet stakeholder expectations and what improvements are necessary to enhance the value creation process. The findings can then be used as an input into the make-buy decision process.

**2.5 Establish strategic make-buy criteria –** Make-buy decisions lie at the very heart of designing supplier networks. In fact, it has been asserted that supply chain design – including the make-buy decision framework – represents the ultimate core competency of enterprises (See Charles Fine, *Clockspeed: Winning industry Control in the Age of Temporary Advantage*, Reading, MA: Perseus Books, 1998, p.69). Inherent in the make-buy calculus, enterprises must decide why and what they should outsource, to reduce cost or to derive greater benefits from supplier-based innovations in order to deliver greater value to customers. Over the short-run (e.g., less than five years) they must weigh whether they will become more dependent on suppliers for capacity or for knowledge– each with quite different ramifications. Over the longer-run, enterprises can alter the mix of labor and capital, in an effort to seek cost-minimizing solutions. Over the longer-run, therefore, the important question becomes what types of knowledge enterprises are willing to outsource. For instance, if an enterprise decides to outsource the engineering and production of a particular component, where that item’s system architecture is integral to the overall system architecture of the enterprise’s primary product platform, the consequences of such a decision can be pretty serious. In general, make-buy decisions tend to become virtually irreversible. The knowledge embedded in an item may be lost forever. This is why enterprises must weigh the short-term cost reduction benefits of outsourcing against the prospect of facing limited future capabilities and options. There are many other risks, as well benefits, associated with strategic outsourcing decisions. The key point to be emphasized here is that enterprises should develop an informed and structured process guiding their outsourcing decisions. Such a step should come prior to defining the “desired future state,” since the make-buy and strategic outsourcing decisions may well alter the way an enterprise may view the topography of its “desired future state.”



- 2.6 Define future state goals and metrics** – The results of the previous two tasks represent important inputs into definition of the “desired future state.” In this sense, any early definition of the “desired future state” concurrently with the self-assessment process can be modified to reflect a deeper consideration of strategic imperatives resulting from the previous two tasks. It is expected that an important outcome of this task will be a definition of the desired “future state” for each of the lean practices defined in the SELF-ASSESSMENT TOOL, as well as a concrete definition of specific improvement opportunities for each of the enabling practices. It is important to note that a given enterprise need not define Level 5 attributes, necessarily, as its “desired future state” for any of the overarching or enabling practices. It should set realistic, achievable, targets. In certain cases, these future targets may reflect stretch goals. In all cases, a definite timeline should be attached to the achievement of these future targets and associated performance metrics. The potential metrics identified for each of the overarching practices in the SELF-ASSESSMENT tool should serve as possible candidate metrics that can be used in defining future performance targets.
- 2.7 Develop supplier network strategic plan** – The enterprise-level vision, goals and objectives pertaining to supply chain management provide the requirements guiding the development of the strategic plan. The plan formalizes the identification of the “current state,” the desired “future state”, and the gap that must be bridged. The strategic mapping of value creation strategies, performed earlier, provides an important input into the definition of the desired “future state.” The task then involves the higher-level strategic tasks that must be carried out, before moving further. These tasks encompass: make-buy and strategic outsourcing decisions (and formalization of the process for making such decisions); major change strategies (e.g., strategic alliances, e-business, knowledge management, fostering innovation internally and across the supplier network); roles and responsibilities, internally as well as across key suppliers; requirements pertaining to functional and organizational structures; desired intra-organizational as well as inter-organizational relationships, governing principles, rules of behavior and reward systems; and infrastructure support requirements. The strategic plan should assign execution responsibilities, measurable performance metrics, checkpoints with deadlines, regular scheduled reviews to assure adherence to plan, and a clear timeline for execution.
- 2.8 Define infrastructure support requirements** – The strategic plan should outline the priority infrastructure support requirements, both internally and across the supplier network. These include requirements for information technologies, education and training, and implementation tools and methods. These requirements represent an “output” from this major building block to be addressed in the next major building block (i.e., Establish Lean Culture and Infrastructure). By analogy to the product design and development process, the specific implementation steps within this major block represent “system design,” while activities in the next building block involve “detailed design.” It should be noted again, for emphasis, that Blocks 2, 3 and 4 are closely coupled through extensive feedback loops.
- 2.9 Define roles and responsibilities, relationships, governing principles and rules of behavior** – A clearly defined and communicated division of labor is important both within the core enterprise and across the supplier network in order for the entire extended enterprise to

perform efficiently. Within the core enterprise, traditionally the procurement or material department is given the responsibility of dealing with the suppliers, in an environment in which that department typically functions as a support organization serving the product development and manufacturing operations. The limitations of this type of organizational model are well recognized. Increasingly, many enterprises have evolved integrated teams representing engineering, manufacturing, quality, procurement and other essential functions within the enterprise, grouped around product families, to interact with similarly integrated teams representing their key suppliers. Different enterprises may choose different solutions that best suit their individual needs. The main idea is to make sure that all of the enterprise's interactions with suppliers are managed as efficiently and effectively as possible. Roles and responsibilities, as well as key governing principles and rules of behavior, must also be defined clearly across the supplier network. This is essential for the creation of a robust value proposition linking the core enterprise particularly with its key suppliers, shaping mutual value expectations and exchanges. For example, if, as a result of the enterprise's make-buy criteria, a system formerly designed and built internally is now to be outsourced, the mutual expectations between the enterprise and the prospective supplier for that system must be clearly defined, understood and shared as to leave no room for any "hostage-holding" behavior by that supplier in the future. More generally, the enterprise needs to reach a common understanding of the ground rules for cooperative relationships with its selected suppliers.

**2.10 Develop resource plan for executing the strategic plan** – The enterprise must commit resources to the execution of the strategic plan, to make sure that the desired outcomes can be achieved as anticipated. These include all resources (e.g., facilities, capital equipment, manpower, overhead) required to accomplish the goals and objectives. A common mistake made in planning for enterprise transformation is to judge every specific lean initiative in terms of its own narrowly defined "business case." It must be recognized that lean initiatives typically have considerable positive spillover effects that do not necessarily lend themselves to easy quantification. One predictable consequence of the "business-case" approach focusing on individual lean deployment projects, where the results of lean investments are highly localized, is the understatement of lean benefits based on narrowly-defined outcomes. This leads only to islands of success under the best of circumstances and, under a worse set of circumstances, only to disjointed, non-sustainable, lean change initiatives that quickly run out of steam. In general, guided by an enterprise-wide perspective, interconnected chains of lean initiatives should be contemplated, rather than isolated or serial lean implementation steps, to take advantage of economies of leverage (multiplier effects) through exploitation of complementary implementation activities where positive benefits achieved in one particular setting can trigger a cascade of positive effects throughout the organization. Resource planning should be mindful of enterprise-level (global) optimization, rather than encouraging local optimization.

**Roadmap Explorations – Part A (Block 2.0 Develop Supplier Network Strategic Plan): Inputs, Outputs, Barriers, Enablers, Metrics, Tools and Methods**

Inputs	Outputs
<ul style="list-style-type: none"> <li>• The enterprise’s vision of the supplier network linked to its overall strategic vision, incorporating the expectations of key stakeholders (including those of the customer and of major suppliers).</li> <li>• Basic lean principles guiding the development of a strategic plan for the design and management of a lean supplier network.</li> <li>• The enterprise overall business model plan, as well as its operating business plan (e.g., for the strategic planning cycle).</li> </ul>	<ul style="list-style-type: none"> <li>• Definition of the “current state” and the “desired future state” for the supplier network.</li> <li>• Strategic metrics.</li> <li>• Identification of critical value-creating processes.</li> <li>• Definition of the required core competencies.</li> <li>• Strategic make-buy framework and process.</li> <li>• Strategic transition plan.</li> <li>• Identification of infrastructure support requirements.</li> <li>• Definition of roles and responsibilities, governing principles and rules of behavior.</li> <li>• Infrastructure support requirements.</li> <li>• Resource plan for executing the strategic plan.</li> </ul>
Barriers	Enablers
<ul style="list-style-type: none"> <li>• Lack of understanding of the “True North” for the enterprise (i.e., its future vision &amp; the core competencies required to achieve it).</li> <li>• Lack of understanding of the core and boundaries of the enterprise (i.e., what is the core enterprise? What is the extended enterprise?).</li> <li>• Lack of knowledge about key stakeholders (including the customer) and about delivering value (i.e., Who are the key stakeholders? What are their value systems? What is the overall value proposition? What is best lifecycle value to the customer?).</li> <li>• Lack of tools for mapping strategic future enterprise value creation process.</li> </ul>	<ul style="list-style-type: none"> <li>• Develop a clear understanding of the strategic future <i>value proposition</i> for the enterprise, encompassing its key stakeholders.</li> <li>• Understand the importance of supply chain design and management as an enterprise-wide <i>meta core competency</i>.</li> <li>• Develop and employ effective tools and methods for mapping strategic value creation processes (internally and across the supplier network).</li> </ul>

Metrics	Tools and Methods
<ul style="list-style-type: none"> <li>• Focus on measuring the degree of leanness of your enterprise’s supply chain management capabilities, by using the Supplier Management Self-Assessment Tool.</li> <li>• Define the desired future state, the metrics associated with it, and focus on the “gap” between the current state and the desired future state.</li> </ul>	<ul style="list-style-type: none"> <li>• Tools and methods for designing supply chain management strategy.</li> <li>• Methods and techniques for making make-buy decisions (considering such factors as globalization, offset requirements, need to gain access to new technologies and markets, cost-sharing as well as risk-sharing, etc.).</li> <li>• Supplier Management Self-Assessment Tool.</li> </ul>

**Roadmap Explorations—Part B (Block 2.0 Develop Supplier Network Strategic Plan): Why, What, Who, How, Where, When**

<b>Why</b>	<b>Tensions</b>
<ul style="list-style-type: none"> <li>• Provide long-term guidance to achieving vision, goals and objectives.</li> <li>• Outline the desired outcomes at well-specified points in time.</li> <li>• Align the activities toward the defined goals.</li> <li>• Figure out what to focus on – Figure out what is the right job to do and also how to determine that we are doing the right job.</li> </ul>	<ul style="list-style-type: none"> <li>⇒ <i>Fear of friction within the organization.</i></li> <li>⇒ <i>Risk of unattainable plans.</i></li> </ul>
<b>What</b>	<b>Tensions</b>
<ul style="list-style-type: none"> <li>• Roadmap for creating value for the stakeholders.</li> <li>• Living document.</li> <li>• Structured process to guide the supplier network transformation process.</li> <li>• Baseline for understanding the “current state” as well as for determining the “desired future state.”</li> <li>• Basis for action.</li> <li>• Set of objectives; drives behavior.</li> <li>• Enables shift in the market position (competitiveness) of the enterprise.</li> </ul>	<ul style="list-style-type: none"> <li>⇒ <i>Risk of developing an over-specified and too-structured strategic plan.</i></li> <li>⇒ <i>False sense of security.</i></li> <li>⇒ <i>May stifle creativity.</i></li> <li>⇒ <i>May focus on wrong areas.</i></li> <li>⇒ <i>May not have enough structure.</i></li> </ul>
<b>Who</b>	<b>Tensions</b>
<ul style="list-style-type: none"> <li>• Enterprise leadership team.</li> <li>• Outside help (consultants or facilitators).</li> <li>• Not done by silo organizational units, which may lead to local optimization.</li> <li>• Stakeholders with an incentive to participate.</li> <li>• Should include vice presidents, directors and program managers.</li> </ul>	<ul style="list-style-type: none"> <li>⇒ <i>Delegation of responsibility may backfire in terms of desired outcomes.</i></li> <li>⇒ <i>Lack of expertise or knowledge within the enterprise may pose a problem.</i></li> <li>⇒ <i>How to manage interpersonal conflicts or opposing points-of-view.</i></li> </ul>

<b>How</b>	<b>Tensions</b>
<ul style="list-style-type: none"> <li>• Through a process of self-assessment.</li> <li>• Value stream mapping and analysis.</li> <li>• Benchmarking.</li> <li>• Defining the desired future state.</li> <li>• Obtain enterprise-level vision.</li> </ul>	<ul style="list-style-type: none"> <li>⇒ <i>Following an “ad hoc” rather than a structured or disciplined approach.</i></li> <li>⇒ <i>Providing inadequate detail.</i></li> <li>⇒ <i>Using faulty information.</i></li> <li>⇒ <i>Basing plans on faulty assumptions.</i></li> </ul>
<b>Where</b>	<b>Tensions</b>
<ul style="list-style-type: none"> <li>• Where the pertinent knowledge and insight resides; should not be an “ivory tower” exercise.</li> <li>• “War-room” type of working environment can and should be used as appropriate.</li> <li>• Off-site meetings may be conducive to consensus building in a “no-threat” environment.</li> </ul>	<ul style="list-style-type: none"> <li>⇒ <i>How to make sure that the process doesn’t become the equivalent of “smoke filled rooms.”</i></li> <li>⇒ <i>How to ensure that the “where” issue doesn’t turn into a “who is exercising authority” issue.</i></li> <li>⇒ <i>Side communications through e-mail, etc., should not be a substitute for face-to-face meetings.</i></li> </ul>
<b>When</b>	<b>Tensions</b>
<ul style="list-style-type: none"> <li>• Should be done periodically, most likely on an annual basis.</li> <li>• Following the definition of enterprise-level vision, goals and objectives, but keeping in mind that this would most likely be an iterative process.</li> </ul>	<ul style="list-style-type: none"> <li>⇒ <i>Possible shift in leadership or “ownership” of the process may prove destabilizing in performing the tasks involved.</i></li> <li>⇒ <i>How to make sure that the resulting strategic plan is not rendered obsolete by fast-paced changes or innovations.</i></li> </ul>

### **3.0 ESTABLISH LEAN CULTURE AND INFRASTRUCTURE**

#### **Implementation Steps:**

- 3.1 Identify and empower change agents** – Change agents refer to those individuals who, by virtue of their background, knowledge, energy, demeanor, vision and considerable interpersonal and persuasive skills, can facilitate and act as a catalyst for systemic changes in organizations. These are individuals who are often “driven” and who have a passion for accomplishing transformational change. Such individuals typically command respect from their peers and are trusted by their co-workers “to do the right thing” as well as “to do it right.” Change agents from within the organization would bring to the effort an understanding of the prevalent organizational culture and core values, such that lean change initiatives can preserve positive aspects of the existing culture and reinforce these core values while transforming the enterprise. This is important since a major failure of the re-engineering initiatives in the 1990s involved jettisoning existing organizational cultures and core values in favor of “clean-sheet-of-paper” design of work processes and systems, neglecting the “people” aspects of organizational transformation.
  
- 3.2 Align processes and procedures** – Align and streamline processes and procedures pertaining to supply chain design and management at a strategic and tactical level, to make sure that the enterprise’s higher-level goals and objectives are met by the supply chain management processes and procedures at the operational level. The requirements for processes and procedures should be integrated to ensure that they are aligned efficiently and effectively. The emphasis here is on ensuring on-going higher-level strategic and tactical vigilance concerning decisions guiding much more detailed, lower-level, processes, functions and activities. Examples include: make-buy and strategic outsourcing criteria, supplier selection process, methods for capturing and documenting supplier process capabilities, supplier certification procedures, supplier development tools and methods, organization and management of procurement functions and processes (e.g., contract design and management procedures, subcontract management, integrated supplier management teams, order placement, supplier payment process, requirements forecasting and communication, inspection and testing procedures, parts management process), supplier-integrated design and development processes, technical data exchange tools and protocols, optimal inventory management policies and strategies; and strategies for integrating the supplier network into enterprise resource planning (ERP) systems.
  
- 3.3 Define organizational structure and interfaces** – Ensure the creation of organizational structures and management systems that accelerate and enhance decision-making at the point of knowledge, application and need. Avoid relegating supply chain management functions to a narrowly-defined silo “procurement” organization, within a particular business unit or across multiple business units. Make sure that supply chain management functions integrated tightly into multiple entities (e.g., engineering, manufacturing, multiple programs or product platforms) and levels of the entire enterprise. It takes the entire enterprise to design, manage and sustain the supplier network, since supply chain management, ultimately, is a “meta-core competency” of the whole enterprise. Matrixed relationships and incentives pertaining to supply chain management must be established and integrated across the enterprise.

### **3.4 Develop and integrate information technologies (IT) and information systems (IS)**

**infrastructure** – Create the basic IT/IS infrastructure and associated systems and capabilities to ensure seamless flow of information internally and across the supplier network in support of operational plans and lean implementation initiatives aimed at closer supplier integration into the enterprise’s engineering, manufacturing, and sustainment operations, involving both direct production suppliers and “indirect” suppliers providing a variety of supporting goods and services (e.g., office supplies, data processing, payroll accounting, security services). When fully implemented, the IT/IS infrastructure should provide for internet-enabled communication links with suppliers, allowing for technical data exchanges as well as communication of requirements forecasts, orders, deliveries, and financial transactions. For example, when fully implemented, the IT/IS infrastructure should enable a digital design and manufacturing environment, ensuring database commonality as well as common development processes, tools and shared resources. The IT/IS infrastructure should make it possible to evolve one configuration source for all product data, containing all engineering drawings, process specifications, quality control measures, and material requirements. The IT/IS infrastructure should have the capability for efficient procurement of high-volume standardized items, provide multi-tier visibility into inventories across the supplier network, and integrate third-party logistics providers into the supply chain management process.

**3.5 Define reward systems and incentives** – Part of the task of establishing lean culture and infrastructure within the enterprise, as well as across the supplier network, is to structure incentives to reward lean behavior. This means the consideration of both monetary and non-monetary incentives, removing disincentives, and designing metrics and related incentives motivating desired behavior on the part of both dispersed individuals and groups (team-based incentives). An example of an internal incentive mechanism might be rewarding groups of buyers based on reducing the cost of entire systems rather than rewarding individual buyers on the basis of reducing the cost of individual parts or components. Another example might be the sharing of cost savings with suppliers through the use of target costing practices.

**3.6 Develop knowledge infrastructure and expertise for lean transformation** – Knowledge infrastructure for lean transformation of the supplier network entails a compilation and dissemination of key lean principles and practices pertaining to supply chain design, development and management. This involves the development of a knowledge base on lean principles associated with each of the overarching practices identified in the SELF-ASSESSMENT Tool. Lean transformation requires not only a deep understanding of lean principles and practices but also their translation into educational and training materials or modules for use at different levels, both internally within the core enterprise and externally across the supplier network. Such educational and training modules would be aimed at inculcating lean thinking at all levels. Lean training would strive to foster lean practices and behavior towards meeting defined goals or targets. Lean education and training involves a lot of “learning-by-doing,” as well as learning from the experience of others. The organization should be open to the possibility of making mistakes along the way and allow plenty of room for experimentation and learning. Thus, it should be recognized that while developing the requisite knowledge infrastructure can propel and channel lean initiatives, the lean transformation process itself should allow for both individual and group learning that can come only through



implementation. Refer to the DESK REFERENCE for the types of topics where educational and training materials would be required.

**Roadmap Explorations – Part A (Block 3.0 Establish Lean Culture and Infrastructure): Inputs, Outputs, Barriers, Enablers, Metrics, Tools and Methods**

<b>Inputs</b>	<b>Outputs</b>
<ul style="list-style-type: none"> <li>• Definition of the “current state” and the “desired future state” for the supplier network.</li> <li>• Strategic metrics.</li> <li>• Identification of critical value-creating processes.</li> <li>• Definition of the required core competencies.</li> <li>• Strategic make-buy framework and process.</li> <li>• Strategic transition plan.</li> <li>• Identification of infrastructure support requirements.</li> <li>• Definition of roles and responsibilities, governing principles and rules of behavior.</li> <li>• Infrastructure support requirements.</li> <li>• Resource plan for executing the strategic plan.</li> </ul>	<ul style="list-style-type: none"> <li>• Identification of key change agents within the enterprise.</li> <li>• Aligned processes and procedures.</li> <li>• Organizational structure and defined interfaces.</li> <li>• IT/IS system architecture and infrastructure.</li> <li>• Internal rewards and incentives plan.</li> <li>• Educational and training materials (modules).</li> <li>• Program implementation plan (template).</li> <li>• Knowledge base for supporting lean supply chain implementation.</li> </ul>
<b>Barriers</b>	<b>Enablers</b>
<ul style="list-style-type: none"> <li>• Lack of knowledge and expertise internally.</li> <li>• Lack of management commitment.</li> <li>• Lack of time and resources.</li> <li>• Resistance to change (e.g., cultural factors).</li> <li>• Lack of a perceived need for change (e.g., lack of competition).</li> <li>• Distrust, internally and externally across suppliers.</li> <li>• Uncertain future business environment.</li> <li>• Absence of standardization (e.g., IT/IS interface protocols)</li> <li>• Lack of uniform Department of Defense (DoD) policy.</li> </ul>	<ul style="list-style-type: none"> <li>• Lean champions and change agents.</li> <li>• Openness to change within and outside the enterprise.</li> <li>• Success stories (e.g., proven payback from pilot initiatives).</li> <li>• Strong competition in the market.</li> <li>• Customer driven environment.</li> <li>• Proven tools and methods that can be employed.</li> <li>• Supplier councils.</li> <li>• Engagement and commitment of labor organizations.</li> <li>• Electronic commerce (internal, external).</li> <li>• Knowledgeable consultants.</li> </ul>

Metrics	Tools and Methods
<ul style="list-style-type: none"> <li>• Focus on the enterprise’s progress by gauging the capability maturity levels of the enterprise for applicable practices defined in the Supplier Management Self-Assessment Tool. These include:               <ul style="list-style-type: none"> <li>○ Create internal organizational structures and basic infrastructure systems for efficient management of supplier network (Enabling Practice 1.5).</li> <li>○ Establish open and timely communications with suppliers (Enabling Practice 3.3).</li> <li>○ Design the contracting process to enable flexibility and adaptation to changing requirements (Enabling Practice 5.2).</li> <li>○ Create information infrastructure and shared tools for collaborative design and development with suppliers, as well as for electronic engineering data exchange.</li> <li>○ Create knowledge transfer mechanisms for open and rapid access throughout the supplier network (Enabling Practice 7.3).</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Engineering, manufacturing and supply chain management tools and methods.</li> <li>• Training and education materials on lean principles and methods for supply chain management.</li> <li>• Project management tools.</li> <li>• Benchmarking.</li> <li>• Process mapping.</li> <li>• Enterprise information systems reference models (e.g., ERP system architectures).</li> <li>• Job descriptions.</li> <li>• Workflow management systems.</li> <li>• Knowledge management systems.</li> </ul>

**Roadmap Explorations—Part B (Block 3.0 Establish Lean Culture and Infrastructure): Why, What, Who, How, Where, When**

<b>Why</b>	<b>Tensions</b>
<ul style="list-style-type: none"> <li>• Organization, infrastructure and process drive behavior, and behavior drives results.</li> <li>• Creates an essential foundation for lean implementation to build lean supplier networks.</li> </ul>	<ul style="list-style-type: none"> <li>⇒ <i>Fear and uncertainty</i></li> <li>⇒ <i>Competition for resources.</i></li> <li>⇒ <i>Labor-management tensions.</i></li> </ul>
<b>What</b>	<b>Tensions</b>
<ul style="list-style-type: none"> <li>• Customer-focused, process-oriented, and results-driven.</li> <li>• Establishes the organizational framework, infrastructure systems and processes, systems and behavioral rules.</li> <li>• Ensures processes are well understood, are in place, and are designed to create value.</li> </ul>	<ul style="list-style-type: none"> <li>⇒ <i>Risk of forcing uniformity.</i></li> <li>⇒ <i>Challenges “tribal customs” – changes in the status quo may not be uniformly embraced.</i></li> <li>⇒ <i>Challenges organizational “rice bowls.”</i></li> </ul>
<b>Who</b>	<b>Tensions</b>
<ul style="list-style-type: none"> <li>• Directors, champions, change agents and subject matter experts.</li> <li>• Customer as well as suppliers.</li> </ul>	<ul style="list-style-type: none"> <li>⇒ <i>Risk of having the “wrong” people defining and leading the change process.</i></li> <li>⇒ <i>“Wrong” leadership may not be well-suited for the tasks at hand.</i></li> <li>⇒ <i>Lack of passion on the part of one or more of key stakeholders.</i></li> </ul>
<b>How</b>	<b>Tensions</b>
<ul style="list-style-type: none"> <li>• By showing mastery or profound understanding of the processes involved.</li> <li>• Communication and education.</li> <li>• Typically requires a critical mass of “zealots” dedicated to the mission and related tasks.</li> <li>• Establish a business case for investment, but take an enterprise perspective rather than local payoffs.</li> </ul>	<ul style="list-style-type: none"> <li>⇒ <i>Lack of expertise.</i></li> <li>⇒ <i>People holding on to legacy systems and processes.</i></li> <li>⇒ <i>“Not invented here” syndrome.</i></li> <li>⇒ <i>“What’s in it for me?” mentality.</i></li> </ul>
<b>Where</b>	<b>Tensions</b>
<ul style="list-style-type: none"> <li>• Throughout the entire enterprise.</li> </ul>	<ul style="list-style-type: none"> <li>⇒ <i>Stakeholder resistance.</i></li> <li>⇒ <i>Incompatible infrastructure elements, financing mechanisms, information systems infrastructure, requirements planning, supplier infrastructure capabilities.</i></li> </ul>

When	Tensions
<ul style="list-style-type: none"> <li>• Should be closely monitored periodically, most likely on an annual basis.</li> <li>• Should be coordinated with the strategic planning cycle in terms of major initiatives.</li> </ul>	<p>⇒ <i>Implementation timetables may not be neatly scheduled to coincide with the typical quarterly or annual performance review time cycles</i></p> <p>⇒ <i>How to coordinate the creation of the necessary lean culture and infrastructure on a time scale and at a temp that is synchronized with enterprise-wide development of lean culture and infrastructure. Possible shift in leadership or “ownership” of the process may prove destabilizing in performing the tasks involved.</i></p> <p>⇒ <i>How to make sure that the resulting strategic plan is not rendered obsolete by fast-paced changes or innovations.</i></p>

## 4.0 CREATE AND REFINE LEAN IMPLEMENTATION PLAN

### Implementation Steps:

**4.1 Define, map and analyze supplier network value stream** – This task calls for the definition, mapping and analysis of the supplier network value stream. A product or service “value stream” is the specific set of activities, processes and functions required to transform raw materials and other resources into finished products or services delivered to the customer. “Value stream mapping” is the analytical process used to identify and describe the current state of material and information flows associated with the design, development, production and sustainment of specific products and/or services spanning across multiple processes, functions and organizational units. “Value stream” analysis focuses on an identification of the sources of waste (*muda*), or “non-value-creating-activities,” and determination of improvement opportunities to eliminate waste and to reduce cycle (flow) time across the value stream.

“Value stream *analysis*,” as used in this context, integrates the results of the self-assessment process, outlined earlier, and the detailed *value stream mapping* task entailed here. Namely, the self-assessment process and related tasks outlined earlier would have produced a clear definition of both “current state” and “desired future state” for the respective overarching practices. However, these “desired future state” definitions may or may not be realistic. They may need to be redefined in light of the more detailed value stream mapping task outlined here. Also, benchmarking may be performed to provide inputs into the process of defining “desired future states” for the various overarching practices, to improve the enterprise’s competitive advantage. The end result here would be a reconciliation or integration of the “desired future state” definitions for the various overarching practices and for associated functions and processes, before moving further to develop specific implementation plans. Refer to the DESK REFERENCE for references on value stream mapping and analysis.

**4.2 Create tactical metrics and implementation plans to address gaps identified in self-assessment** – The SELF-ASSESSMENT Tool contains potential metrics that can be used for each of the eight defined overarching practices. This task involves, first, definition of appropriate performance metrics for each overarching practice, and for each enabling practice (as appropriate). It also involves the development of implementation plans to bridge the gap between the “current state” and “desired future state” for each overarching practice, by taking into account the interdependencies among them, in order to achieve the overall enterprise-wide goals and objectives. The implementation plan should encompass detailed consideration of requirements in terms of technology and tools, information systems, processes, organizational structures, and staffing.

An important aspect of developing the implementation plan is to identify, prioritize and sequence specific improvement initiatives. As well, time-phased resource requirements must be determined and adequate resources for implementation must be committed. Also, educational and training needs must be identified at a level of detail and at a greater level of specificity than before.

There are multiple paths to lean implementation to evolve lean supplier networks. Enterprises must choose those alternatives that best meet their needs. The discussion provided below on “roadmap explorations,” focusing on such questions as why, what, who, how, when and where might provide useful information in connection with the planning activities.

It is important to note that the lean implementation planning activities encompass work on all of the overarching practices, as well as enabling practices, identified in the SELF-ASSESSMENT Tool. The overarching practices encompass:

- Design supplier network architecture
- Develop complementary supplier capabilities
- Create flow and pull throughout the supplier network
- Establish cooperative relationships and effective coordination mechanisms
- Maximize flexibility and responsiveness
- Pursue supplier-integrated product and process development
- Integrate knowledge and foster innovation
- Demonstrate continuous improvement.

**4.3 Develop educational and training materials for lean implementation** – Many companies have already assembled extensive educational and training materials on the fundamentals of lean thinking as well as on the basics of building lean supplier networks. Rather than “re-inventing the wheel,” it might be quite helpful to borrow such material from other organizations. Also, LAI is an excellent reservoir of tools and methods that can be tapped readily to help assemble the needed material. For example, numerous presentations at various LAI workshops and conferences cover many aspects of lean supply chain implementation, ranging from supplier certification to supplier value stream mapping. Expected output of this task would be training materials, supplier engagement plans, lean diagnostic tools for assessing the lean state of suppliers, and communication plans for sharing the material broadly, both within the core enterprise and across the supplier network. The DESK REFERENCE contains many references that should be helpful in identifying and developing the required educational and training materials.

**4.4 Commit resources for lean implementation**– Successful implementation of lean principles and practices to evolve lean supplier networks requires the commitment of resources. Financial, technical and manpower resources are typically required. These include the time of personnel, an important asset, as well as external consultants that might be retained to flow lean practices to suppliers. Some companies that have successfully implemented lean principles and practices typically report that few additional resources, other than people, are required. Considerable benefits can, and have been, derived long before committing substantial capital resources. Still, it should not be concluded that lean benefits can always be achieved “on the cheap.” It is important to recognize that significant resources must be committed to support an extensive educational and training program over the years. This includes the allocation of resources for the training and development of suppliers, through *kaizen* events and rapid improvement programs. Moreover, relationship-specific investments may be required in operations and processes of specific suppliers to help develop or improve complementary capabilities, as part of creating strategic supplier alliances. Commitment of

resources should be seen as a coordinated enterprise-wide strategic and tactical step rather than as a routine budgeting function for traditionally defined procurement or material operations.



**Roadmap Explorations – Part A (Block 4.0 Create and Refine Lean Implementation Plan): Inputs, Outputs, Barriers, Enablers, Metrics, Tools and Methods**

Inputs	Outputs
<ul style="list-style-type: none"> <li>• Requirements for the lean implementation plan derived from the enterprise-level vision, strategic plan, and the infrastructure support system for building lean supplier networks.</li> <li>• Flowdown of specific issues, concerns and expectations from the enterprise-level lean implementation process (e.g., resulting from the application of <i>TTL</i>; <i>LESAT</i>; <i>Enterprise Value Stream Mapping and Analysis [EVSMA]</i>).</li> </ul>	<ul style="list-style-type: none"> <li>• Implementation plan for developing lean supply chain management capabilities:               <ul style="list-style-type: none"> <li>○ Approach</li> <li>○ Constraints and assumptions</li> <li>○ Success criteria</li> <li>○ Toolkit checklist</li> <li>○ Timeframe (milestones)</li> <li>○ Business case.</li> </ul> </li> <li>• Tactical metrics.</li> <li>• Educational and training materials (modules) for both internal and external use.</li> <li>• Standard supplier engagement plan and process.</li> <li>• Criteria for selecting lean candidates, supplier lean assessment and qualification tools               <ul style="list-style-type: none"> <li>○ Internal data; degree of strategic importance of suppliers</li> <li>○ Supplier assessment results</li> <li>○ Integrated product teams (IPTs) determination to implement lean or qualify suppliers in lean.</li> </ul> </li> <li>• Resource plan for lean implementation.</li> </ul>

Barriers	Enablers
<ul style="list-style-type: none"> <li>• No clear business case or motivation for change.</li> <li>• Lack of supplier management buy-in.</li> <li>• Perception: message lacks credibility.</li> <li>• Inappropriate organizational structure; no empowerment.</li> <li>• Union and/or employee concern about impact on them.</li> <li>• Accounting disincentives for lean implementation.</li> <li>• Geographical location of suppliers.</li> <li>• Lack of resources (manpower, funding, space, etc.).</li> <li>• Lack of data or information on prior history.</li> <li>• Worker distrust of management.</li> <li>• Litany of failed initiatives in the past.</li> <li>• Government contracting; inability to keep cost savings.</li> <li>• History of supplier-customer mistrust.</li> <li>• Customer is very small portion of supplier’s business.</li> <li>• Progress payments by the government customer.</li> <li>• Supplier is sole source.</li> <li>• Supplier unwillingness to share information (e.g., process capability, costs).</li> <li>• Perceived lack of commitment to supplier.</li> </ul>	<ul style="list-style-type: none"> <li>• Clear and compelling definition of “desired future state” (vision, goals, metrics)</li> <li>• Shared sense of urgency and/or motivation for change.</li> <li>• Develop “compact” with top leadership, labor organizations and employees to clarify roles and responsibilities as well as to help create solidarity of purpose.</li> <li>• Providing early involvement opportunities for various stakeholders.</li> <li>• Knowledge about supplier core competencies</li> <li>• Existence of an “industry-wide” set of accepted standards and processes for supplier lean assessment, qualification and certification.</li> <li>• Availability of a common suite of lean deployment tools for flowing lean principles to suppliers, including smaller lower-tier suppliers.</li> <li>• Communication to suppliers of the qualification and certification level earned by the enterprise, conferred by the enterprise’s customer.</li> <li>• Clear definition of lean principles and practices that can be widely disseminated and shared.</li> <li>• Up-to-date and accurate data on the progress being made by suppliers towards implementing lean principles.</li> </ul>

Metrics	Tools and Methods
<ul style="list-style-type: none"> <li>• Focus on the enterprise’s progress by gauging the capability maturity levels of the enterprise for applicable practices defined in the Supplier Management Self-Assessment Tool. These include: <ul style="list-style-type: none"> <li>○ Select suppliers based on criteria optimizing core competencies internally and across suppliers (Enabling Practice 1.3)</li> <li>○ Segment suppliers into differentiated categories based on their relative strategic importance in creating value (Enabling Practice 1.4)</li> <li>○ Perform evaluation of complementary supplier capabilities (Enabling Practice 2.1)</li> <li>○ Implement management processes ensuring effective differentiated relationships with suppliers (Enabling Practice 4.1)</li> <li>○ Establish partnerships and strategic alliances with key suppliers to achieve performance improvement, shared mutual benefits, and long-term competitive advantage (Enabling Practice 4.2)</li> <li>○ Progressively delegate greater design and build responsibility to key suppliers to achieve fast and flexible product development, reduce cost and improve quality (Enabling Practice 6.2)</li> <li>○ Establish mutually-beneficial contractual arrangements to nurture and capture supplier-based innovations to reduce costs, improve quality and shorten time-to-market (Enabling practice 7.2)</li> <li>○ Ensure on-going alignment of technology roadmaps across the supplier network in pursuance of a common strategic vision (Enabling Practice 7.4).</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Enterprise change models (e.g., applicable concepts and tools from Lean Thinking, Six Sigma, Reengineering, Total Quality Management (TQM) and other change models).</li> <li>• Specific tools developed by LAI for enterprise-level lean implementation (e.g., <i>Lean Enterprise Model [LEM]</i>; <i>TTL</i>; <i>LESAT</i>; <i>EVSMA</i>).</li> <li>• Value stream mapping tools.</li> <li>• Gap analysis tools: “As-Is” (current state) to “To-Be” (desired future state).</li> <li>• Supplier management self-assessment tools (e.g., <i>Supplier Management Self-Assessment Tool</i> developed by LAI); supply chain survey data; benchmarking.</li> <li>• Supplier development educational and training materials.</li> </ul>

**Roadmap Explorations—Part B (Block 4.0 Create and Refine Lean Implementation Plan): Why, What, Who, How, Where, When**

<b>Why</b>	<b>Tensions</b>
<ul style="list-style-type: none"> <li>• Translation of the vision and strategic plan into an integrated set of lean implementation initiatives.</li> <li>• Need to prioritize implementation initiatives, since resources are limited and the need for lean transformation is urgent.</li> <li>• Need to refine plans progressively; this is not a one-time exercise.</li> <li>• Important to make structured progress across many areas by adopting and implementing lean supply chain practices as defined in the <i>Supplier Management Self-Assessment Tool</i>.</li> </ul>	<ul style="list-style-type: none"> <li>⇒ <i>How to organize and coordinate the process of creating and refining the implementation plan across the enterprise?</i></li> <li>⇒ <i>How to prioritize lean initiatives?</i></li> <li>⇒ <i>How to strike a balance between internal coherence in the plan and buy-in from the various stakeholders?</i></li> <li>⇒ <i>How to terminate “sacred cow” projects that may be siphoning-off a lot of scarce resources when there are urgent priorities that need to be pursued?</i></li> </ul>
<b>What</b>	<b>Tensions</b>
<ul style="list-style-type: none"> <li>• Deliberate action plan crafted on a regular basis (e.g., annually, with updates quarterly) and refined on an on-going basis, informed by the self-assessment process and value stream mapping across the supplier network</li> <li>• Identification, specification and prioritization of lean implementation initiatives specifically designed for building lean supplier networks.</li> <li>• Integrated and scheduled actions with well-defined objectives, time-lines, process-ownership, expected outcomes, and resource commitments.</li> </ul>	<ul style="list-style-type: none"> <li>⇒ <i>How to be comprehensive and focused at the same time?</i></li> <li>⇒ <i>How to make sure that the priorities in the plan do not reflect favorite projects of certain people?</i></li> <li>⇒ <i>How to overcome internal politics in selecting key lean implementation initiatives?</i></li> <li>⇒ <i>How to deal with management pressures for quick results in developing and refining an implementation plan?</i></li> </ul>
<b>Who</b>	<b>Tensions</b>
<ul style="list-style-type: none"> <li>• Enterprise leadership from across the whole organization, representing different functional groups and processes.</li> <li>• It is important to iterate the process with senior enterprise leadership.</li> <li>• Outside assistance (e.g., consultants) can be helpful to augment expertise within the enterprise, but should not be used as a substitute.</li> </ul>	<ul style="list-style-type: none"> <li>⇒ <i>How to deal with various enterprise stakeholders sending their “stand-ins” to internal planning meetings?</i></li> <li>⇒ <i>What if the people selected to coordinate planning activities do not command the respect of others on the team?</i></li> <li>⇒ <i>How to ensure that the concerns and perspectives of all stakeholders are given a serious reading?</i></li> </ul>

<b>How</b>	<b>Tensions</b>
<ul style="list-style-type: none"> <li>• Create an enterprise-wide council of top leaders responsible for supply chain design, development and management, to serve as an integrative body within the enterprise.</li> <li>• Appoint a senior process owner to serve as the main coordinator across various organizational or functional units.</li> <li>• Create integrated teams from across the enterprise, each with responsibility for different building blocks of the roadmap.</li> <li>• Have these integrated teams work on an on-going basis, with periodic “all teams” meetings to monitor progress and integrate activities.</li> </ul>	<p>⇒ <i>How do you develop and refine a plan like this under constant management pressure for quick results and still make sure that the implementation of the planned lean initiatives will have a lasting and significant impact?</i></p> <p>⇒ <i>How to manage the sequences and interdependencies in lean implementation? (NOTE: Here is where the Design Structure Matrix and related tools can be useful.)</i></p>
<b>Where</b>	<b>Tensions</b>
<ul style="list-style-type: none"> <li>• Anywhere in the enterprise where the knowledge and responsibility for action reside.</li> <li>• Make sure that a cross-section of the enterprise leaders in such areas as engineering, program management, manufacturing, procurement, contracts, business processes and other areas are engaged.</li> </ul>	<p>⇒ <i>Entrenched groups may see this as a threat and may seek a middle-of-the-road approach that may undermine the transformational thrust of the implementation plan.</i></p> <p>⇒ <i>Internal politics and compromises may dampen the effectiveness of the plan.</i></p> <p>⇒ <i>Make sure there is not a tendency to split too many differences, which may undermine the strength of the plan.</i></p>
<b>When</b>	<b>Tensions</b>
<ul style="list-style-type: none"> <li>• Preferably after the proper environment has been created (e.g., in terms of a clear definition of the enterprise’s vision, goals and objectives pertaining to supplier integration, development of a firm strategic plan, and achievement of solid progress towards the creation of the necessary lean culture and infrastructure)</li> <li>• Only after you have created the proper environment in terms of a clear definition of enterprise’s vision, goals and objectives pertaining to supplier integration, a firm strategic plan, and solid progress concurrently being pursued to develop the necessary lean culture and infrastructure.</li> </ul>	<p>⇒ <i>There is always pressure for quick results. How do you do this quickly and completely, while still balancing near-term and longer-term priorities?</i></p> <p>⇒ <i>There is a risk of cutting corners and doing neither the right thing or doing it the right way.</i></p> <p>⇒ <i>How to avoid people stepping on each other’s toes and not getting anywhere – how to anticipate, plan out and integrate the various types of interdependencies to make sure that the lean implementation initiatives, taken together, bring about significant benefits.</i></p>

## 5.0 IMPLEMENT LEAN INITIATIVES

### Implementation Steps:

**5.1 Communicate goals, objectives and metrics throughout the supplier value stream** – This implementation step involves the clear communication of its supplier-related vision, goals and objectives across the supplier network. This is an important preparatory step before launching lean implementation initiatives. The communication of goals and objectives should pave the way for developing a shared purpose across the supplier network, reinforcing earlier steps to develop a common vision, goals and objectives. In this task, more specific performance metrics are mutually established with suppliers. Such a step is necessary for lean deployment. The main idea is that, over time, the enterprise can create an open and sharing environment where mutual roles and responsibilities are clearly defined and trust-based collaborative relationships are established in order to institutionalize a process of achieving tangible mutual performance improvements. Thus, this step represents an implementation and reinforcement of basic ideas established earlier. Namely, the enterprise’s supplier network strategy is crucial for improving its competitive advantage, where competition between firms is replaced by competition between networks of firms.

**5.2 Implement lean transformation initiatives (on-going)** – This task encompasses the concrete implementation actions aimed at achieving the “desired future state” associated with the respective overarching and related enabling practices. This is where ideas and detailed plans are turned into action. Change strategies often fail when they are not executed well. Execution involves the systematic process of doing the right things and doing things in the right way. It requires tenacity, following through, and accountability. It also allows for “learning by doing.” This means empowering people not to be afraid to take risks, and rewarding individual as well as team performance.

It is important to note that the implementation activities undertaken here encompass the implementation of transition initiatives for all of the practices defined in the SELF-ASSESSMENT Tool. These implementation activities must be prioritized, programmed and executed with the direct support of top-level leadership and by empowering people who are directly involved. The lean transformation process to build lean supplier networks may entail multiple pathways. There is no unique method, formula or recipe for accomplishing fundamental change. It is further point out that the lean implementation activities encompass work on all of the overarching practices, as well as enabling practices, identified in the SELF-ASSESSMENT Tool. The overarching practices encompass:

- Design supplier network architecture
- Develop complementary supplier capabilities
- Create flow and pull throughout the supplier network
- Establish cooperative relationships and effective coordination mechanisms
- Maximize flexibility and responsiveness
- Pursue supplier-integrated product and process development
- Integrate knowledge and foster innovation
- Demonstrate continuous improvement.

Some of the key implementation activities would include the following:

- Select suppliers;
- Perform supplier lean assessment;
- Perform supplier qualification and certification;
- Conduct focused value stream mapping and analysis, concentrating on major critical parts and components;
- Deploy supplier development and mutual improvement initiatives;
- Initiate targeted change models (internal, external)-- Radical, incremental; pilot projects to test and demonstrate specific change initiatives and enablers (pilot-evaluate-scale up).
- Implement procurement plan (e-business) and collaborative design initiatives with key suppliers;
- Implement performance-based lean contractual relationships (e.g., long-term relationships; partnerships; strategic alliances; mutual gainsharing arrangements);
- Conduct internal and external training as appropriate to achieve lean implementation objectives.

### **5.3 Capture feedback on strategic barriers to lean implementation and share lessons learned on key enablers**

– This task documents, on an on-going basis, the emerging barriers to change and how they are overcome, thus providing a running repository of “lessons learned” in overcoming barriers to lean implementation. The discussion given below on “roadmap explorations” identifies some of the key barriers that may be encountered in lean implementation. These include, for instance, lack of supplier buy-in, inadequate resources, inappropriate organizational structures, government-imposed contractual constraints, and other factors. It is not unusual to run into serious obstacles by entrenched “rice bowls” or vested interests whose power position may well be altered by the proposed changes. These obstacles become especially critical in cases where the proposed transition process from the “current state” to the “desired future state” entails not marginal but radical changes. In such cases, it may sometimes become necessary to bring in change leadership from outside the particular organizational unit or entity that is directly affected, along with change agents not steeped in the local culture resisting change. An important role of leadership is to help remove the barriers to change, provide “top cover” for efforts aimed at overcoming barriers, and unlock pockets of local resistance to change.

**Roadmap Explorations – Part A (Block 5.0 Implement Lean Initiatives): Inputs, Outputs, Barriers, Enablers, Metrics, Tools and Methods**

<b>Inputs</b>	<b>Outputs</b>
<ul style="list-style-type: none"> <li>• Lean implementation plan, including all plans and actions enveloping the design and building of the lean infrastructure support system consistent with the enterprise-level vision and strategic objectives.</li> <li>• Flowdown of specific issues, concerns and expectations from the enterprise-level lean implementation process (e.g., resulting from the application of <i>TTL</i>; <i>LESAT</i>; <i>EVSMA</i>) that require “real-time” adjustments in implementation steps related to the design, development and management of lean supplier networks.</li> </ul>	<ul style="list-style-type: none"> <li>• Achievement of specific goals, objectives and metrics pertaining to the design, development and management of the supplier network, reflecting enterprise-level vision, strategic objectives and performance metrics</li> <li>• Robust, high-performance and high-quality supplier network characterized by enhanced capability, productivity, knowledge base and innovation, as well as healthy financial performance.</li> </ul>
<b>Barriers</b>	<b>Enablers</b>
<ul style="list-style-type: none"> <li>• Lack of supplier management buy-in.</li> <li>• Inappropriate organizational structure; no empowerment.</li> <li>• Accounting disincentives for lean implementation.</li> <li>• Geographical location of suppliers.</li> <li>• Lack of resources (manpower, funding, space, etc.).</li> <li>• Lack of data or history on supplier performance.</li> <li>• Worker distrust of management.</li> <li>• History of failed initiatives.</li> <li>• Government contracting disincentives, such as inability to keep cost savings.</li> <li>• History of supplier-customer mistrust.</li> <li>• Customer is very small portion of supplier’s business.</li> <li>• Progress payments by the government customer.</li> <li>• Supplier is sole source.</li> <li>• Lack of willingness by suppliers to share cost, process or other performance data.</li> <li>• Perceived lack of commitment to supplier.</li> </ul>	<ul style="list-style-type: none"> <li>• Implementation plan supports enterprise-level lean transition plans, while concurrently enterprise-level lean transition activities enable implementation steps related to designing, developing and managing lean supplier networks.</li> <li>• Achievement of performance milestones are tied directly to defined performance measures, which are then flowed down throughout the supplier network.</li> <li>• Involvement and commitment of top-level leadership that removes inter-jurisdictional barriers and disputes.</li> <li>• E-enabled communication network.</li> <li>• Availability of just-in-time training as the need arises or as certain implementation-related weaknesses are exposed.</li> <li>• Availability and deployment of technical or funding assistance by various governmental units (e.g., federal, state), in such areas as worker training or productivity improvement aimed at the needs of medium and small size suppliers.</li> <li>• Establishment of cooperative programs by a group of enterprises to help improve the performance of their key common suppliers.</li> </ul>



Metrics	Tools and Methods
<ul style="list-style-type: none"> <li>• Focus on the enterprise’s progress by gauging the capability maturity levels of the enterprise for applicable practices defined in the Supplier Management Self-Assessment Tool. These include: <ul style="list-style-type: none"> <li>○ Align and develop critical internal and external supplier capabilities (Enabling Practice 2.3): For example, compliance of key suppliers with ISO 9000 and related standards; percent of key suppliers that have gold, silver or lead certification.</li> <li>○ Create dedicated assets in the extended enterprise (Enabling Practice 2.4); for example, cost savings [and/or quality improvements] through co-investment with key suppliers in improvement of critical processes or technologies.</li> <li>○ Evolve controlled and repeatable supplier processes (Enabling Practice 3.2); for example, Six Sigma process capability index for critical suppliers.</li> <li>○ Establish open and timely communications with suppliers (Enabling Practice 3.3); for example, percent of key suppliers with which the enterprise has established capability for digital exchange of engineering drawings.</li> <li>○ Synchronize production and delivery throughout the supplier network (Enabling Practice 3.4); for example, percent of all supplier deliveries to point-of-use just-in-time without prior inspection.</li> <li>○ Establish partnerships and strategic alliances with key suppliers to achieve performance improvement, shared mutual benefits, and long-term competitive advantage (Enabling Practice 4.2); for example, percent of all direct purchases from suppliers under supplier partnerships or long-term purchase agreements.</li> <li>○ Ensure network-wide flexibility and adaptation to planned</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Performance metrics.</li> <li>• Value stream mapping tools.</li> <li>• Supplier lean assessment toolset.</li> <li>• Supplier process capability database.</li> <li>• Supplier qualification or certification standards, tools, methods and subject area expertise.</li> <li>• Supplier development educational and training materials as well as trained personnel for lean deployment to suppliers.</li> <li>• Enterprise change models (e.g., applicable concepts and tools from Lean Thinking, Six Sigma, Reengineering, Total Quality Management (TQM) and other change models).</li> <li>• Specific tools developed by LAI for enterprise-level lean implementation (e.g., <i>LEM</i>; <i>TTL</i>; <i>LESAT</i>; <i>EVSMA</i>).</li> <li>• Gap analysis tools: “As-Is” (current state) to “To-Be” (desired future state).</li> <li>• Supplier management self-assessment tools (e.g., <i>Supplier Management Self-Assessment Tool</i> developed by LAI); supply chain survey data; benchmarking.</li> </ul>

as well as unanticipated changes and disruptions (Enabling Practice 5.3); for example, mean expected order-to-shipment response time by key suppliers for parts and materials should the enterprise have to increase its demand for such items by 25%, 50%, or 100%.

- Integrate suppliers early into design and development processes and teaming structures (Enabling Practice 6.1); for example, total cost of rework as percent of total product development cost due to Class I engineering changes.
- Progressively delegate greater design and build responsibility to key suppliers to achieve fast and flexible product development, reduce cost and improve quality (Enabling Practice 6.2); for example, percent of total engineering hours for all parts accounted for by suppliers or percent of all direct production suppliers integrated into design and development process before preliminary design review.
- Establish mutually-beneficial contractual arrangements to nurture and capture supplier-based innovations to reduce costs, improve quality and shorten time-to-market (Enabling practice 7.2); for example, percent of all direct production suppliers incentivized to reduce production costs or improve product performance (or quality) through cost-sharing arrangements and/or through arrangements involving sharing of cost savings.
- Ensure on-going alignment of technology roadmaps across the supplier network in pursuance of a common strategic vision (Enabling Practice 7.4); for example, percent of all direct production suppliers that are provided access to customer enterprise's future technology roadmaps and R&D priorities.

## Roadmap Explorations—Part B (Block 5.0 Implement Lean Initiatives): Why, What, Who, How, Where, When

Why	<i>Tensions</i>
<ul style="list-style-type: none"> <li>• Strengthen the enterprise’s lean supply chain management capability and improve the performance of the enterprise’s supplier network (e.g., eliminate waste, reduce cost, improve productivity, create value across the entire extended enterprise covering the supplier network).</li> <li>• Reduce waste, accelerate speed (e.g., shorter cycle time), and improve efficiency throughout the extended enterprise.</li> <li>• Create transformational change.</li> <li>• Move the enterprise towards the desired end-state to enhance its competitiveness through the application of resources and measures.</li> <li>• Demonstrate traction towards making real changes affecting the bottom line – this is where the rubber hits the road.</li> </ul>	<ul style="list-style-type: none"> <li>⇒ People may well resist new ways of doing things, believing that the old ways of doing things is still the best.</li> <li>⇒ Creates the impression that we don’t already have a “perfect” or even “good enough” internal capability and supplier network in place.</li> <li>⇒ Implementation efforts may be taking place at a time when the enterprise is already under great stress.</li> <li>⇒ Top management may balk at the price tag of lean implementation, before seeing significant bottom-line benefits immediately.</li> <li>⇒ Top management may push for quick hits, damaging a carefully orchestrated implementation game plan.</li> <li>⇒ How to avoid local optimization (e.g., improved order placement, inventory management, etc.) that may undermine total enterprise-wide performance optimization?</li> <li>⇒ People just don’t see the value of implementing lean principles, in light of a history of past initiatives, broken promises and threats to the overall welfare of the workforce.</li> </ul>
What	<i>Tensions</i>
<ul style="list-style-type: none"> <li>• Doing the right job, and doing it right, by working smarter.</li> <li>• Re-designing and aligning processes across the supplier network in order to eliminate waste, reduce variability and improve performance.</li> <li>• Making sure that the enterprise achieves continuous flow (products, processes), takes advantage of the economies of speed and improves its competitive advantage in the marketplace.</li> <li>• Empowering flexible, capable and highly motivated people to be change agents</li> <li>• Assuring the reliability of people, processes, technology and information across the entire network.</li> </ul>	<ul style="list-style-type: none"> <li>⇒ <i>Must not be deterred by occasional setbacks – must push on with lean implementation.</i></li> <li>⇒ <i>Implementation efforts need to be prioritized, clearly communicated and well-executed.</i></li> <li>⇒ <i>Possible motto: “lean implementation is the boss,” not individual functional groups or departments, in order to anticipate and overcome internal disputes or organizational conflicts.</i></li> <li>⇒ <i>Some suppliers may “push back” on the enterprise’s lean implementation initiatives, while others may be unaware of lean thinking and associated benefits.</i></li> </ul>

<b>Who</b>	<b>Tensions</b>
<ul style="list-style-type: none"> <li>• All people engaged in implementation activities to evolve a lean supplier network – this takes the entire enterprise, not just the traditional procurement, material or purchasing departments.</li> <li>• Sample of stakeholders in designing, developing and managing a lean supplier network include: engineering, manufacturing, contracting, quality, procurement, supplier development, internal inventory and material management, and other parts of the entire (particularly top management engaged in the development of the enterprise’s vision, business model, make-buy criteria, and annual business or operating plan).</li> </ul>	<ul style="list-style-type: none"> <li>⇒ <i>Those not exposed to lean thinking may well reject any involvement; this is why top-level management support and commitment to the execution of the ROADMAP is absolutely necessary</i></li> <li>⇒ <i>Make sure that the people assigned to lean implementation are the most capable personnel for the challenges being faced</i></li> <li>⇒ <i>Financial and accounting departments may take a dim view of the benefits of lean implementation, especially when existing accounting practices impede quantification of lean impacts cutting across the enterprise</i></li> <li>⇒ <i>The key people involved in lean implementation must be “in the line of fire” in product development, manufacturing and related activities; they must not be perceived as “toothless” consultants – this is why line management in specific programs must be directly engaged in lean implementation right alongside the supplier management personnel.</i></li> </ul>
<b>How</b>	<b>Tensions</b>
<ul style="list-style-type: none"> <li>• Create an enterprise-wide council of top leaders responsible for supply chain design, development and management, to serve as an integrative body within the enterprise – particularly to monitor and coordinate the implementation process.</li> <li>• Appoint a senior process owner to serve as the main coordinator across various organizational or functional units.</li> <li>• Create integrated teams from across the enterprise, each with responsibility for different building blocks of the roadmap.</li> <li>• Have these integrated teams work on an on-going basis, with periodic “all teams” meetings to monitor progress and integrate activities.</li> <li>• Utilize lessons learned from best available research and examples from best practice companies.</li> </ul>	<ul style="list-style-type: none"> <li>⇒ <i>Must guard against an “implementation as usual” approach</i></li> <li>⇒ <i>Lean implementation must move away from one-shot, short-duration, Kaizen events at selected supplier sites – to be effective, they must take place on an on-going basis and must pay attention to the timing for “booster shots”.</i></li> </ul>

<ul style="list-style-type: none"> <li>• Follow a structured network-wide implementation plan.</li> <li>• Follow an interconnected set of principles, practices, tools and methods that drive out waste and help create value.</li> <li>• Focused value stream mapping and analysis is a powerful tool for focusing supplier lean development activities.</li> </ul>	
<b>Where</b>	<b>Tensions</b>
<ul style="list-style-type: none"> <li>• Both internally within the core enterprise and across the supplier network, not neglecting the lower-tier suppliers that may well account for roughly one-third of the total cost of production of specific products or systems.</li> <li>• Anywhere in the enterprise where the knowledge and responsibility for action reside.</li> <li>• In all factory work stations – must remember that continuous flow is not possible unless supplier deliveries arrive at the right time, in the right quantity, at the right place, and with the highest quality.</li> <li>• Concentration on locations exhibiting work stoppages and backlogs to uncover supplier delivery and/or quality issues.</li> </ul>	<p>⇒ <i>You don't want to create islands of success here and there – this would undermine the whole implementation effort.</i></p> <p>⇒ <i>How far down into the supplier network do you want to or can reach?</i></p> <p>⇒ <i>There may be a tendency to concentrate on more downstream suppliers and processes within shouting distance of the customer enterprise, but reaching more upstream to lower-tier suppliers and re-arranging roles and responsibilities there (e.g., more kitting) might bring greater cost-reduction benefits.</i></p> <p>⇒ <i>Don't forget that sometimes you may have to start out small in certain places and then scale up those efforts after demonstrating success – weigh the potential benefits and costs of "patience" (or "impatience") in effecting wide-scale changes.</i></p> <p>⇒ <i>Make sure you don't try to accommodate the localized interests of too many groups or places across the supplier network that may dilute the impact of the implementation efforts.</i></p>
<b>When</b>	<b>Tensions</b>
<ul style="list-style-type: none"> <li>• After having developed a coherent implementation plan.</li> <li>• When wasteful processes and practices are clearly inhibiting value creation.</li> <li>• When customer satisfaction appears to be "going south."</li> <li>• When key performance metrics indicate that significant changes are necessary for the enterprise's overall success.</li> <li>• Anytime is a good time to start; the cost of waiting can prove to be exorbitant in terms of the benefits foregone.</li> </ul>	<p>⇒ <i>The enterprise may be currently performing well and there may appear be no imminent need for adopting lean principles.</i></p> <p>⇒ <i>Top management may not be willing to "face up" to the need for fundamental change.</i></p>

## 6.0 STRIVE FOR CONTINUOUS IMPROVEMENT

### Implementation Steps:

- 6.1 Evaluate results against future state goals and metrics** – In this step the results obtained are compared with the stated future goals and metrics, in order to evaluate the degree of success achieved by the enterprise in meeting these targets. The development of a system of metrics must be accompanied by enterprise-wide transparency, accountability and the sharing of the performance results. Both internal and external performance metrics must be developed and used. Metrics are useful if they are used for achieving continuous improvement, rather than as a part of a command-and-control system. These metrics should cover all of the overarching practices outlined in the SELF-ASSESSMENT Tool. For example, metrics such as customer satisfaction, cycle time, cost, quality and delivery-to-need are established and monitored on an on-going basis. Customer satisfaction can be defined in a number of ways, such as in terms of initial acquisition/purchasing cost, lifecycle cost of ownership, performance to schedule, mission capability and effectiveness of the products or systems delivered, reliability, technological upgradability, and ease and cost of maintenance. Evaluation of performance against established targets can be productive, rather than punitive, when the process of evaluation itself becomes a means for continuous improvement, through root cause analysis in areas where performance is found to be seriously deficient. The diagnostic questions, lean indicators and potential metrics identified under “Overarching Practice 8 – Demonstrate continuous performance improvement” identified in the SELF-ASSESSMENT Tool might be consulted. The specific practices listed there, as well, can be employed to ensure continuous improvement. This implementation step mirrors “Enabling Practice 8.1 – Develop and analyze effective metrics to identify network-wide continuous improvement opportunities” identified in the SELF-ASSESSMENT Tool.
- 6.2 Identify network-wide improvement opportunities** – The use of a system of performance metrics and assessment of the enterprise’s overall progress towards meeting established targets should indicate opportunities for improvement across the entire supplier network. These improvement opportunities may involve poor supplier delivery, quality and cost performance in certain areas. Many enterprises typically compile detailed supplier performance data, particularly in connection with their supplier certification programs. Such databases should reveal, on a routine basis, obvious supplier performance improvement opportunities. Sometimes, perhaps more often than generally admitted, primes and major suppliers may be following certain practices or procedures that may be adversely affecting supplier performance. Vigilance and transparency must be exercised to identify and resolve root causes of inadequate performance. The improvement opportunities identified must be communicated to lean implementation teams on a real-time basis. This implementation step is addressed in “Enabling Practice 8.2 – Incentivize mutually-beneficial continuous improvement of products and processes throughout the supplier network over the entire lifecycle” identified in the SELF-ASSESSMENT Tool.
- 6.3 Nurture the process of continuous improvement** – This task involves a proactive process of nurturing continuous improvement throughout the extended enterprise. Part of the process involves obtaining the engaged support, encouragement and commitment of the enterprise leader and senior managers. Such leadership engagement will be important when the

enterprise's transformation runs into various snags. Special attention must be paid to incentives and rewards to make sure that they are well understood and are working well. The key is to motivate individuals, teams and organizations to adopt desired behavior leading to directionally-correct improvements that would lead to system-level optimization rather than local optimization. Actively soliciting and rewarding suggestions for further improvement should be part of the process. Positive reinforcement should be encouraged wherever possible. Success should be celebrated and those (e.g., personnel, specific suppliers) demonstrating tangible performance improvements should be publicly recognized and rewarded. Whenever the opportunity presents itself, the "ownership" of lean process improvements should be transferred to the suppliers, empowering and incentivizing them to achieve the required improvements as actively engaged stakeholders. This implementation step mirrors "Enabling Practice 8.2 – Incentivize mutually-beneficial continuous improvement of products and processes throughout the supplier network over the entire lifecycle" identified in the SELF-ASSESSMENT Tool.

**6.4 Communicate needed changes in vision, strategy and support infrastructure** – Based on the results attained, it is entirely possible that the vision, goals and objectives set earlier may have to be revised. Communicating such feedback on needed changes on a real-time basis is particularly important in an environment of fast-moving changes in the external environment (e.g., markets, technology). Establishing such a closed-feedback-looped adaptive system is very important. This enables a process of learning-by-doing. Assessing progress against the established metrics may well indicate various disconnects and mismatches in enterprise vision, strategy and support infrastructure. Also, the lean implementation plan, as well as the actual lean implementation activities, may need to be re-calibrated, as discussed below ("Implementation Step 6.5 – Modify and refine tactical implementation plan and activities"). For instance, the speed with which ERP systems are installed may be disconnected from the imperative to communicate production requirements effectively and on a timely basis to suppliers in order to deliver to customer's schedule or expressed need. As a result of the activities in this implementation step, the enterprise's vision, supplier network strategy, support infrastructure and implementation plan, as well as implementation activities may be changed or fine-tuned. In the normal course of events (i.e., in the steady-state) the feedback loop may directly connect "Block 6 – Strive for continuous improvement" to "Block 2.0 – Develop supplier network strategic plan." Periodically, however, the feedback loop from Block 6 should directly go to "Block 1.0 – Define vision" to allow for any changes or refinements in the enterprise's overall vision, goals and objectives, and business model. This means that the relatively slower clockspeed activities (i.e., vision, strategy, infrastructure). This implementation step mirrors "Enabling Practice 8.3 – Capture, communicate and apply experience-generated learning across the supplier network" identified in the SELF-ASSESSMENT Tool. Refer to Figure 2, where the top three building blocks represent the relatively slower clockspeed activities, while the lower three building blocks represent relatively faster clockspeed activities and are much more closely coupled.

**6.5 Modify and refine tactical implementation plan and activities** – This task requires a re-examination of the tactical implementation plans in light of the observed progress against the previously established performance targets. The result will be re-calibration of these plans, leading to making any mid-course corrections, as required. It will be necessary, of course, to

define areas for further improvement and to prioritize these improvement targets of opportunity as an input into any re-adjustments in tactical and implementation plans. For instance, a mismatch that is detected between lagging supplier on-time delivery *and* the enterprise's production *takt time* may indicate a need for redoubling supplier training and development activities. This implementation step represents a faster clockspeed feedback loop connecting linking continuous improvement activities to the lean implementation planning activities. The implementation step mirrors "Enabling Practice 8.2 – Incentivize mutually-beneficial continuous improvement of products and processes throughout the supplier network over the entire lifecycle."

**6.6 Capture, adopt and rapidly communicate new knowledge** – Capturing lessons-learned and disseminating them throughout the enterprise can provide a powerful stimulus for enterprise-wide organizational learning, fueling an on-going process of learning and capability-building. Proactive processes must be in place for capturing and communicating experience-based knowledge both within the core enterprise and across its supplier network. Such knowledge encompasses success stories in various enterprise processes, functions and practices, including both design and manufacturing innovations. It may also include cases of failure -- often providing unforgettable cautionary tales spurring important performance improvements. In this context, it is well to remember that Toyota's knowledge-sharing practices resulted in accelerated learning by its suppliers, improving their productivity and the quality of their products. It is important to understand that accelerated knowledge-sharing creates a learning network, which is critical for enhancing longer-term competitive advantage. In the same vein, it is important to note that an enterprise will fail to enhance its competitive advantage if it is unable to adopt network-centric thinking – competition between specific enterprises is now replaced by competition between enterprise networks. This implementation step mirrors "Enabling Practice 8.2 – Incentivize mutually-beneficial continuous improvement of products and processes throughout the supplier network over the entire lifecycle," as well as "Enabling Practice 8.3 – Capture, communicate and apply experience-generated learning across the supplier network" identified in the SELF-ASSESSMENT Tool.



**Roadmap Explorations – Part A (Block 6.0 Strive for Continuous Improvement): Inputs, Outputs, Barriers, Enablers, Metrics, Tools and Methods**

Inputs	Outputs
<ul style="list-style-type: none"> <li>• Lean implementation activities put into motion in support of all eight overarching practices (and associated enabling practices) driving supply chain design, development and management.</li> <li>• Longitudinal metrics data (e.g., monthly, quarterly) for individual implementation projects under way, linked to specific functional areas or processes targeted for improvement.</li> <li>• Performance metrics for specific functional areas and processes translated into progress being made in achieving “desired future state” goals and objectives for each of the overarching and associated enabling practices governing all supply chain management activities.</li> </ul>	<ul style="list-style-type: none"> <li>• On-going measurement of progress being made towards the achievement of specific goals, objectives and metrics pertaining to the design, development and management of the supplier network, linked to overall enterprise-level vision, strategic objectives and performance metrics.</li> <li>• Tangible evidence of progress towards the development of a robust, high-performance and high-quality supplier network characterized by enhanced capability, productivity, knowledge base and innovation, as well as healthy financial performance.</li> <li>• Capturing and sharing of new knowledge and lessons learned.</li> <li>• Nurturing a culture of continuous learning, knowledge-sharing and mutual performance improvement.</li> <li>• Continuous feedback to Block 1.0 --Define Vision, Block 2.0 -- Develop Supplier Network Strategic Plan, and Block 3 -- Establish Lean Culture and Infrastructure, as well as to Block 4.0 – Create Lean Implementation Plan and Block 5.0 – Implement Lean Initiatives, including hard evidence in terms of progress being made, lessons-learned, successes as well as failures, and recommendations of corrective actions.</li> </ul>

Barriers	Enablers
<ul style="list-style-type: none"> <li>• Lack of a systematic data collection and reporting system for capturing the desired performance metrics information.</li> <li>• Mistaken perception that those engaged in the development and dissemination of the metrics data are engaged in work that does not “add value.”</li> <li>• Risk of people personalizing the resulting metrics data rather than seeing them as crucial pieces of information the enterprise needs to manage its processes.</li> <li>• Overcoming the perception that the metrics system is not up to the task, or that it is subjective, or that it is unfairly punitive in terms of its ultimate effect rather than being well-intended to help move the enterprise forward.</li> <li>• Lack of useful benchmarking data that can help provide a more general perspective on the progress being made.</li> <li>• Resistance on the part of some suppliers to cooperate in terms of achieving the needed improvement objectives (e.g., not being to share cost, process or other performance data; sole source supplier; customer enterprise accounting for a small share of the supplier’s total sales revenues).</li> <li>• Inappropriate organizational structure for achieving effective continuous improvement (e.g., wherein the personnel engaged in continuous improvement activities are kept separate from the implementation, planning and other activities rather than being integrated with them, for instance through a matrix organization).</li> </ul>	<ul style="list-style-type: none"> <li>• Trained personnel with experience in lean basics and Six Sigma methods who can lead Kaizen events at supplier sites (e.g., with expertise in such areas as design for manufacturing and assembly [DFM/A], integrated product and process development [IPPD], value stream mapping and analysis, workplace organization [visual order, visual control], load leveling and line balancing, standard work, mistake proofing, cellular manufacturing, kitting, statistical process control (SPC), failure modes and effects analysis (FMEA), analysis of variance (ANOVA), and design of experiments [DOE]).</li> <li>• Cross-functional teams encompassing different supply chain management “domains” (e.g., strategic planning, infrastructure support systems, planning, implementation) as well as different enterprise processes (e.g., engineering, manufacturing, quality improvement).</li> <li>• Involvement of all people throughout the enterprise.</li> <li>• Relentless pursuit of cumulative incremental improvements.</li> </ul>

Metrics	Tools and Methods
<ul style="list-style-type: none"> <li>• Focus on the enterprise’s progress by gauging the capability maturity levels of the enterprise for all overarching and enabling practices driving the design, development and management of the enterprise’s supplier network.</li> <li>• Track all defined performance targets associated with the overarching and enabling practices, by mapping how the measurable results of the <i>implementation initiatives</i> help achieve improvement objectives for <i>specific functions or processes</i> and how these, in turn, support the achievement of the improvement targets for all <i>overarching and enabling practices</i>.</li> <li>• Illustrative <i>supplier-networks-centric</i> metrics may include: <ul style="list-style-type: none"> <li>○ Percent of all direct production suppliers in compliance with established quality standards (ISO 9000/AS9000, ISO 9100/AS9100 and related standards).</li> <li>○ Percent of total cost of direct production purchases from suppliers with which the customer enterprise has established supplier partnerships or strategic alliances.</li> <li>○ Percent of total cost of direct production purchases obtained on the basis of “best value” rather than on the basis of the “lowest cost bid.”</li> <li>○ Weighted average percent reduction in unit cost (price) of all items provided by major suppliers that together account for 80% of total cost of purchased direct production materials.</li> <li>○ Mean-to-variance ratio of all shipments (items, shipsets) from suppliers delivered to stock or point-of-use, with no prior source or incoming inspections, on-time as determined by customer enterprise’s production requirements.</li> <li>○ Percent of all direct production suppliers that are provided access to customer enterprise’s future technology</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Performance metrics.</li> <li>• Value stream mapping tools.</li> <li>• Lean product development, manufacturing and supply chain management tools (e.g., those listed immediately above).</li> <li>• Library of Kaizen tools – covering lean product development, lean manufacturing and lean supply chain management practices and tools (such as those identified immediately above), as well as a spectrum of Six Sigma implementation tools designed around the DMAIC method (Design, Measure, Analyze, Improve, Control), including the following: <ul style="list-style-type: none"> <li>○ <i>Define</i> – Identify the problem, set goal, define requirements: <ul style="list-style-type: none"> <li>⇒ <i>Kano Analysis</i> – Method that helps to understand and prioritize customer requirements.</li> <li>⇒ <i>SIPOC Map</i> (Suppliers, inputs, process, outputs, customer) – Mapping tool that provides a high-level “at-a-glance” perspective of the process steps in conjunction with key suppliers, inputs, outputs, and customers.</li> <li>⇒ <i>Quality Function Deployment (QFD)</i> – Structured method for translating customer requirements into functional and physical requirements for designing.</li> </ul> </li> <li>○ <i>Measure</i> – Validate problem identification, refine goal, define key measures of efficiency and effectiveness: <ul style="list-style-type: none"> <li>⇒ <i>Critical-to-Quality Tree</i> – Diagram showing “critical-to-quality” components of the problem driving the collection of specific types of data for the project.</li> <li>⇒ <i>Measurement Assessment Tree</i> -- Determination of Six Sigma metrics (e.g., process capability, process cycle time, defect-per-million-opportunities (DPMO), process yield, rolled throughput yield (RTY)).</li> </ul> </li> <li>○ <i>Analyze</i> – Develop causal hypotheses, identify “vital few” root causes, validate hypotheses: <ul style="list-style-type: none"> <li>⇒ <i>Pareto Analysis</i> – A special type of bar chart showing the fewer components of a problem having the biggest impact</li> </ul> </li> </ul> </li> </ul>

<p>roadmaps and R&amp;D priorities.</p> <ul style="list-style-type: none"> <li>○ Percent of all shipments (items, shipsets) from suppliers found to have quality defects or non-conformances found in the manufacturing or assembly process.</li> <li>○ Mean-to-variance ratio of the Six Sigma process capability levels (<math>c_{pk}</math>) for all defined critical processes of major suppliers that together account for 80% of total cost of purchased production materials.</li> <li>○ Mean expected order-to-shipment response time by key suppliers for parts and materials should the enterprise have to increase its demand for such items by 25%, 50%, or 100%.</li> <li>○ Percent of total engineering hours for all parts in major development programs accounted for by suppliers (and/or percent of all direct production suppliers integrated into design and development process before preliminary design review).</li> <li>○ Percent of all direct production suppliers that are given greater responsibility in terms of design engineering, production (e.g., kitting, assembly of more complex parts), testing and inspection).</li> <li>○ Percent of all direct production suppliers incentivized to reduce production costs or improve product performance (or quality) through cost-sharing arrangements and/or through arrangements involving sharing of cost savings.</li> <li>○ Percent of all direct production suppliers that are provided access to customer enterprise's future technology roadmaps and R&amp;D priorities.</li> </ul> <ul style="list-style-type: none"> <li>• Illustrative <i>individual-suppliers-centric</i> metrics for specific targeted suppliers may cover the following areas (in addition to individualized metrics based on the foregoing or as a supplement to them): <ul style="list-style-type: none"> <li>○ Financial (e.g., savings, target pricing and costing, risk sharing, gainsharing, "lean dividend").</li> </ul> </li> </ul>	<p>(based on the "Pareto Principle" that 80% of the effects are typically due to 20% of the causes).</p> <ul style="list-style-type: none"> <li>⇒ <i>Cause and Effect Diagram (Fishbone Diagram or Ishikawa Diagram)</i> – Visual method showing the possible contributing causes of a particular problem or defect.</li> <li>⇒ <i>Correlation and Regression</i> – Statistical method used for root cause analysis and for making predictions.</li> <li>⇒ <i>Process Mapping</i> – Flowcharting linked steps in a defined process to identify process improvement opportunities.</li> <li>⇒ <i>Tests of Statistical Significance (Chi-Square, t-tests and analysis of variance (ANOVA))</i> – Statistical methods for determining the statistical significance of given causal factors and for detecting statistically significant differences (among processes, plants, time periods).</li> <li>⇒ <i>Design of Experiments (DOE)</i> – Statistical methods for analyzing and quantifying the separate effects of multiple factors on a process or product.</li> </ul> <ul style="list-style-type: none"> <li>○ <i>Improve</i> – Develop ideas to remove root causes, test solutions, standardize solutions and measure results: <ul style="list-style-type: none"> <li>⇒ <i>Mistake Proofing (Poka-Yoke)</i> – Methods and techniques for prevention of defects due to mistakes in the production process.</li> <li>⇒ <i>Failure Modes and Effects Analysis (FMEA)</i> – Method for anticipating problems and their effects in order to take steps to counteract them and reduce or eliminate the attendant risks.</li> </ul> </li> <li>○ <i>Control</i> – Establish standard measures to ensure that performance improvements are sustained over time <ul style="list-style-type: none"> <li>⇒ <i>Statistical Process Control (SPC)</i> – Statistical methods (e.g., control charts) used to measure and evaluate variation in a process and the efforts made to control such variation.</li> <li>⇒ <i>Process Management Chart</i> – Management tool showing the process map, the monitoring plan for critical process steps, and a response action plan for each step being monitored.</li> </ul> </li> </ul>
---	--

- |   |  |
|---|--|
| <ul style="list-style-type: none"><li>○ Delivery (e.g., weekly or daily rate required <i>versus</i> actual delivery; percent of deliveries within the defined “on-time” window).</li><li>○ Quality yield (e.g., first-time yield and scrap rates for low-rate initial [LRIP] production).</li><li>○ Improvement activity level (e.g., participation in educational and training activities).</li><li>○ Workforce flexibility level (e.g., operator cross-training progression scores).</li><li>○ Workplace organization (e.g., radar charts for monitoring all types or sources of waste).</li><li>○ Resource utilization (e.g., inventory or work-in-process turns).</li><li>○ Flow (e.g., lead time; process cycle time).</li></ul> |  |
|---|--|

**Roadmap Explorations—Part B (Block 6.0 Strive for Continuous Improvement): Why, What, Who, How, Where, When**

Why	Tensions
<ul style="list-style-type: none"> <li>• Eliminate waste and improve efficiency throughout the extended enterprise encompassing the supplier network.</li> <li>• Synchronize flow throughout the extended enterprise.</li> <li>• Maintain an on-going challenge to existing processes to institute a culture of continuous improvement.</li> <li>• Ensure continuous learning, adaptation, and innovation throughout the supplier network</li> <li>• Strengthen the enterprise’s lean supply chain management capability and improve the performance of the enterprise’s supplier network (e.g., eliminate waste, reduce cost, improve productivity, create value across the entire extended enterprise covering the supplier network).</li> <li>• Create transformational change.</li> <li>• Move the enterprise towards the desired end-state to enhance its competitiveness through the application of resources and measures.</li> <li>• Demonstrate positive bottom line results on an on-going basis.</li> </ul>	<ul style="list-style-type: none"> <li>⇒ <i>Inherent difficulties in developing a system of metrics may motivate people to optimize their own parochial interests rather than the goals of the enterprise.</i></li> <li>⇒ <i>Tendency of enterprise leadership to think in terms of “industrial age” top-down, command-and-control metrics.</i></li> <li>⇒ <i>Reluctance of top management to take a systems view of the entire extended enterprise, encompassing the supplier network</i></li> <li>⇒ <i>Prevalent feeling in some enterprises that there are two types of suppliers – those that are “sole source” or “strategic partner” suppliers and all other suppliers that can be competed -- and this is all one needs to know about supply chain management.</i></li> <li>⇒ <i>Top management perception that the incremental improvements being achieved are just not good enough to justify the investment the enterprise is making in lean deployment.</i></li> </ul>
What	Tensions
<ul style="list-style-type: none"> <li>• Demonstrating continuous performance improvement by taking a network-centric thinking in lean implementation.</li> <li>• Measuring progress against established metrics driving on-going improvement activities.</li> <li>• Providing feedback on whether the enterprise’s vision, supplier integration strategy, infrastructure, implementation plan and activities should be changed or re-calibrated.</li> <li>• Capturing and disseminating lessons-learned and any new knowledge across the supplier network.</li> </ul>	<ul style="list-style-type: none"> <li>⇒ <i>Are the results tied to lean implementation initiatives or do they represent the results of having adopted good business practices?</i></li> <li>⇒ <i>Legacy metrics have a habit of “hanging on,” impeding any progress.</i></li> <li>⇒ <i>Should not the metrics be changed as the enterprise itself changes and matures?</i></li> <li>⇒ <i>What is the benefit-cost ratio for nurturing continuous improvement across the supplier network?</i></li> </ul>

<b>Who</b>	<b>Tensions</b>
<ul style="list-style-type: none"> <li>• Leadership and personnel across the enterprise representing different parts of the enterprise at various levels (e.g., procurement, engineering, manufacturing, quality, supplier development, information systems).</li> <li>• People responsible for specific functions or processes, ensuring decisions at the point of knowledge.</li> <li>• Suppliers – enabling the lean deployment efforts of the first-tier as well as lower-tier suppliers, by providing them with training assistance, tools and methods.</li> </ul>	<ul style="list-style-type: none"> <li>⇒ <i>Having the type of transparency required by the continuous improvement process can be embarrassing if it means disclosure of performance metrics to outside companies (suppliers).</i></li> <li>⇒ <i>Are the suppliers getting a free ride when the core enterprise provides them with educational and training assistance?</i></li> <li>⇒ <i>How can we tolerate having a “cast of thousands” in continuous improvement activities, as defined here? Can’t we just assign a few people to collect data and report to us what is going on?</i></li> <li>⇒ <i>Suppliers may be unwilling to accept the metrics system being used by the core enterprise.</i></li> <li>⇒ <i>The key people involved in lean implementation must be “in the line of fire” in product development, manufacturing and related activities; they must not be perceived as “toothless” consultants – this is why line management in specific programs must be directly engaged in lean implementation right alongside the supplier management personnel.</i></li> </ul>
<b>How</b>	<b>Tensions</b>
<ul style="list-style-type: none"> <li>• Establish cross-functional teams responsible for continuous improvement activities, linked to the various projects (programs), functional groups (e.g., contracting, information systems, purchasing), and processes (e.g., product development, manufacturing and assembly, supply chain management).</li> <li>• Cross-functional teams working as an extension of an enterprise-wide council of top leaders responsible for supply chain design, development and management that serve as an integrative body within the enterprise – to monitor and coordinate the implementation process as well as to ensure continuous improvement.</li> <li>• Utilize lessons learned from best available research and</li> </ul>	<ul style="list-style-type: none"> <li>⇒ <i>Risk of pursuing narrow continuous improvement efforts that may not scale up to cumulative systemic change.</i></li> <li>⇒ <i>How to institutionalize continuous change in the face of constant pressure for quick-hit benefits?</i></li> <li>⇒ <i>How to learn the real lessons of Kaizen and making sure that the change process becomes self-sustaining at the specific supplier sites?</i></li> <li>⇒ <i>What are the respective roles and responsibilities of the prime (core enterprise), major suppliers, and second-tier suppliers in flowing lean principles throughout the multi-tiered supplier networks?</i></li> <li>⇒ <i>Doesn’t the government have an important role to play in diffusing lean principles throughout the supplier base, on the</i></li> </ul>

<p>examples from best practice companies.</p> <ul style="list-style-type: none"><li>• Pursue a structured network-wide continuous improvement program.</li></ul>	<p><i>grounds that the resulting performance improvements represent a “common good” benefiting the competitiveness of the entire industry?</i></p>
--	--



Where	Tensions
<ul style="list-style-type: none"> <li>• Throughout the extended enterprise, at multiple levels (e.g., top management, engineering, manufacturing, purchasing), including the lower-tier suppliers that may well account for roughly one-third of the total cost of production of specific products or systems.</li> <li>• Anywhere in the extended enterprise where the knowledge and responsibility for action reside.</li> <li>• In all factory work stations at all supplier sites– must remember that efforts aimed at achieving continuous flow throughout the extended enterprise must demonstrate continuous improvement in terms of supplier deliveries at the right time, in the right quantity, at the right place, and with the highest quality.</li> <li>• Concentration on links and nodes throughout the supplier network exhibiting serious constraints to the achievement of continuous flow, reduced cycle time, improved quality and steady efficiency gains.</li> </ul>	<ul style="list-style-type: none"> <li>⇒ <i>Suppliers may find the core enterprise’s metrics-related data collection activities rather intrusive.</i></li> <li>⇒ <i>Aspects of the continuous improvement data collected may not be amenable to any “spinning,” thus putting some people and suppliers under an uncomfortable spotlight.</i></li> <li>⇒ <i>Suppliers may develop a negative perception of the efforts of the core enterprise to capture and disseminate new knowledge, believing that any new knowledge they may have evolved should stay within their own four corners.</i></li> <li>⇒ <b><i>How far down into the supplier network do you want to or can realistically reach, given the obvious resource constraints?</i></b></li> </ul>
When	Tensions
<ul style="list-style-type: none"> <li>• On an on-going basis, with quarterly snapshot results (progress against metrics) and with annual re-assessment of the enterprise’s vision, strategy, support infrastructure, and lean deployment plan and activities.</li> </ul>	<ul style="list-style-type: none"> <li>⇒ <b><i>How can we differentiate between leading and lagging indicator metrics, so that we are not forever fixing yesterday’s problems?</i></b></li> <li>⇒ <i>How do we know when specific metrics are no longer meaningful?</i></li> <li>⇒ <i>How do we know what is causing what in judging progress towards the enterprise’s goals, since different initiatives (and measures associated with them) have varying time-lags in terms of their ultimate impact?</i></li> <li>⇒ <i>Doesn’t the continuous improvement process just reinforce the short-term orientation of enterprises for quick results to satisfy the shareholders?</i></li> <li>⇒ <i>What about long-term initiatives (e.g., product or process innovation) that may ultimately save the enterprise and that</i></li> </ul>

	<i>may end up being short-changed by the continuous improvement mindset?</i>
--	--

## APPENDIX A

### LIST OF PRINCIPAL CONTRIBUTORS

This tool has been developed by LAI's Supplier Networks Working Group, which brings together key people from industry, government, and MIT with professional interest and/or responsibility for various aspects of supply chain design, development and management. The Working Group represents a continuation of LAI's Supplier Networks Team (1993-2002), focusing on research and implementation.

Dr. Kirk Bozdogan, Massachusetts Institute of Technology, Cambridge, MA

Mr. Hamid Akhbari, US Air Force, C-17 System Program Office, Wright-Patterson Air Force Base (WPAFB), OH

Mr. Kerry Frey, Lockheed Martin Aeronautics, Fort Worth, TX.

Dr. Bozdogan has had principal responsibility for leading and coordinating the Group's efforts. He has authored original and subsequent versions of the tool, facilitated the Group's meetings, incorporated the Group's feedback, and provided configuration control for the tool over time. The list of principal contributors includes those members of the Group listed below who have participated in two or more of the following meetings of the Group directly concentrating on the development of this tool:

Date (Workshop, Meeting)	Location	Hosted by
Jan 13-14, 2000 Workshop	Wright-Patterson Air Force Base (WPAFB), Dayton, OH	US Air Force, C-17 System Program Office (SPO)
June 21-22, 2000 Workshop	Torrance, CA	California Manufacturing Technology Center (CMTC)
Aug 10-11, 2000 Working Group Meeting	Cincinnati, OH	TECHSOLVE, INC. (Formerly Institute of Advanced Manufacturing Sciences Inc. -- IAMS)
Sept 21-22, 2000 Working Group Meeting	Long Beach, CA	The Boeing Company
July 15-17, 2002 Working Group Meeting	Fort Worth, TX	Lockheed Martin Aeronautics Co.
March 24, 2003 Working Group Meeting	Dayton, OH	Held in connection with the LAI Plenary Conference
August 26-28, 2003 Working Group Meeting	Cambridge, MA	Massachusetts Institute of Technology
November 24-25, 2003 Working Group Meeting	Indianapolis, IN	Rolls-Royce Corp.

Participant	Affiliation
David Abbett	Northrop Grumman Integrated Systems, Irving, TX (subsequently Lockheed Martin Aeronautics, Fort Worth, TX)
Hamid Akhbari	US Air Force, C-17 System Program Office, Wright-Patterson Air Force Base (WPAFB), OH
Charles Ballard	Boeing Integrated Defense Systems, St. Louis, MO
Peggy Berry	Boeing Integrated Defense Systems, C-17 Airlifter, Long Beach, CA
Kirkor Bozdogan	Lean Aerospace Initiative, MIT, Cambridge, MA
John Crabill	US Air Force Research Laboratory (AFRL), Materials and Manufacturing Directorate, Manufacturing Technology Division, WPAFB, OH
Tim Christopherson	Raytheon Systems, Tucson, AZ
Christopher Darden	Northrop Grumman Integrated Systems Sector, El Segundo, CA
Richard DeLappe	Boeing Commercial Airplanes, Renton, WA
Wendy Engstrom	Boeing Commercial Airplanes, Renton, WA
Kerry Frey	Lockheed Martin Aeronautics Co., Fort Worth, TX
James Gilbert	California Manufacturing Technology Center (CMTC), Gardena, CA
Julia Gissel	Boeing Integrated Defense Systems, C-17 Airlifter, Long Beach, CA
James Hester III	Textron Systems, Wilmington, MA
Jerry Khoury	California Manufacturing Technology Center (CMTC), Torrance, CA
Mary McCullough	Rockwell Collins, Cedar Rapids, IA
Ronald McDonald	Boeing Space and Communications, Canooga Park, CA; Raytheon Aircraft Integration Systems, Waco, TX; L-3 Communications, Waco, TX
John McLaughlin	Rolls-Royce Corp., Indianapolis, IN
Susan Moehring	TECHSOLVE, INC., Cincinnati, OH
Todd Powell	US Air Force, ASC/YTJV, WPAFB, OH
Collin Reeves	Raytheon Systems, Plano, TX
George Reynolds	Northrop Grumman Electronic Systems, Linthicum, MD
Gregory Staley	US Air Force, F/A-22 System Program Office, WPAFB, OH
Dale Williams	General Electric Aircraft Engines, Cincinnati, OH
Leland Williams	Boeing Aerospace Support, San Antonio, TX
Ken Willingham	Raytheon Systems, Plano, TX