Executive Summary

Research overview

The research herein covers lean enterprise transformation in the aerospace industry, conducted under the auspices of the Massachusetts Institute of Technology's (MIT) Lean Aerospace Initiative (LAI). Leading indicators of lean enterprise transformation, as measured by the Lean Enterprise Self-Assessment Tool (LESAT), are studied as a means for informing management decisions for achieving and accelerating the transformation process. Arguments from literature are made in support of the assumption that a leaner enterprise can outperform a less lean enterprise. This study uses cross-sectional and time series LESAT data, along with directed interview data, to disprove the null hypotheses associated with each of the following primary hypotheses, namely:

H1) Enterprises that exhibit a greater value of lean enterprise Transformation and Leadership Process maturity will exhibit a greater value of lean Lifecycle Process maturity

H2) Enterprises that exhibit a greater value of lean enterprise Transformation and Leadership Process maturity will exhibit a greater value of lean Enabling Infrastructure Process maturity

H3) Enterprises that exhibit a greater value of lean Enabling Infrastructure Process maturity will exhibit a greater value of lean Lifecycle Process maturity

LESAT data was collected from a total of 31 enterprises from the US and UK aerospace industry. Each enterprise data set consisted of an average of eleven individual assessments conducted by senior enterprise leadership committee members. Enterprises in this study were considered to be business units, divisions, or sites that had profit and loss (P&L) accountability for some set of aerospace products or services.

Main Findings

The LESAT tool was not designed to be a benchmarking tool, and as such no average industry lean enterprise maturity data is reported in this thesis. The data does, however, allow for the rank ordering of lean enterprise practices. This ranking provides several insights into the current state of lean enterprise transformation maturity in the aerospace industry. First, the industry exhibits its lowest maturity in practices related to crafting and deploying the lean enterprise vision, even though it does exhibit high maturity in lean production. Second, integration of lean in strategic planning (LESAT practice I.A.1) ranked highly, suggesting that enterprise strategic planners are considering lean as one of their operating tools. Yet, leveraging lean capability for business growth (LESAT practice II.A.1) and impacting enterprise strategic planning (LESAT practice I.G.5) ranked low. This suggests that the actual benefits realized with lean are not informing the strategic planning process. This would indicate a potential open-loop management system that "considers" lean in strategic planning, but does not strategically build plans based on the gains that lean is actually providing the enterprise.

The empirical data in this thesis supports the three primary hypotheses by showing strong correlations in each of the three proposed relationships (H1, H2, and H3). Additional evidence suggests that the causal inference associated with these hypotheses may exist. The implications for industry are that lean enterprise change efforts must have mature leadership/transformation processes in order to improve the maturity of lifecycle processes and enabling infrastructure. Maturity in these processes will lead to improved P&L results and better enterprise stakeholder value delivery, all else being equal.

A subdivision of the leadership/transformation variable indicates that leadership commitment (LC) is an essential prerequisite for establishing a lean change environment (CE), which in turn enables detailed lean change activities to occur in practice (CP). These variables represent the three major cycles of the LAI Transition-to-Lean (TTL) roadmap, namely the entry/reentry cycle, the long-term cycle, and the short-term cycle. Empirical evidence supports the causal inference between these variables. Further analysis also suggests that the current structuring of the TTL is a logical way to organize

and prioritize lean enterprise transformation activities, and should produce better results than an ad-hoc improvement process.

The new knowledge associated with this thesis suggests that the creation of formal management information feedback, associated with lean enterprise change activities, is necessary for achieving lean enterprise transformation. Furthermore, the structuring of improvement activities within this information feedback model, as shown in

Figure 1, may lead to the acceleration of the lean enterprise transformation compared to an enterprise that does not establish the information feedback loops. The recommendation for enterprises attempting lean enterprise transformation is to begin by establishing leadership anxiety or desire for lean enterprise transformation. This will help establish strong leadership commitment. Next, a lean office or group should be established. If there is an existing continuous improvement office, then the lean group should be incorporated as part of this office. Lean transformation efforts need to be supported as part of regular enterprise operations. If the lean office is considered a separate entity working on the sidelines, and not viewed as a strategic resource, then the transformation efforts will face serious resistance as they inherently cross functional, process, and corporate management boundaries. The Transition to Lean (TTL) Roadmap, or a modified version thereof, should be used as a guide for organizing and sequencing lean enterprise transformation activities. Finally, the lean enterprise transformation information feedback connections identified in

Figure 1 must be established and managed as part of normal enterprise operating procedures. These feedback mechanisms will ensure that there is continued awareness and support for the transformation, and that the gains associated with the transformation are utilized to the enterprise's best strategic advantage. Enterprises operating in this manner will be better positioned to outperform their competitors.
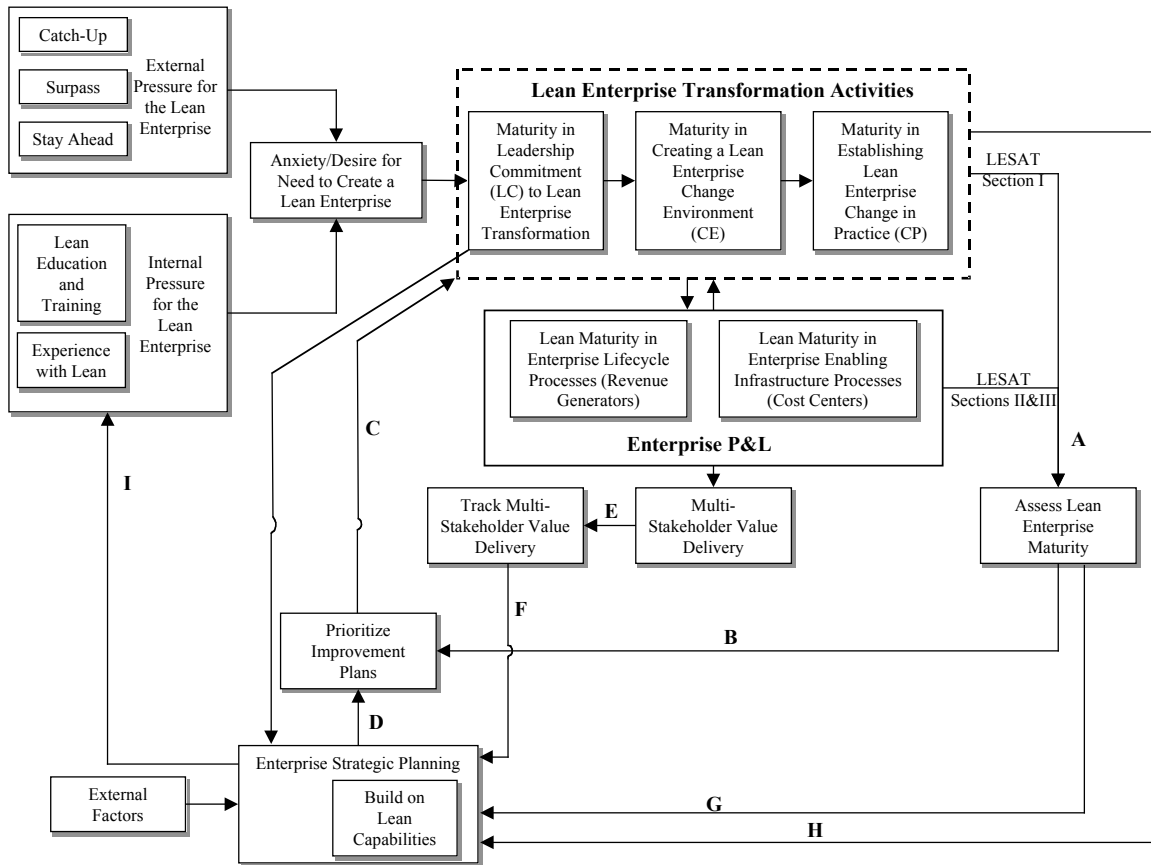
Figure 1 - Proposed lean enterprise transformation information feedback model.

Barriers to Adoption

The most obvious barrier to adopting this model for lean enterprise transformation is that it requires leadership commitment. While there is evidence that local lean efforts may succeed at improving local performance metrics, there is no evidence that lean enterprise transformation can occur without leadership support, as the change efforts necessarily cross functional, process, and corporate management boundaries. The "islands of success" discussed in this thesis highlight the fact that a major limiting factor in

expanding local lean improvement efforts has been the need to go beyond the management authority of the local leader.

The next barrier is that successful lean implementation will require the establishment of a lean change office (or a lean team within a continuous improvement office). This necessarily means the allocation of scarce resources to lean efforts. This team must then manage, track, and provide information feedback to enterprise leadership that enables them to make strategic decisions with respect to the lean capabilities of the enterprise. If the lean efforts are viewed as a "flavor of the month" improvement program, establishing these feedback mechanisms as part of routine enterprise operations may have little support. In the event that the management environment is supportive of lean enterprise transformation, the lean change team must be adequately prepared to understand and deploy lean, and have the ability and authority to help change organizational behavior at all levels of the enterprise. This is perhaps the single hardest element of the transformation puzzle, especially as it means redefining employee attitudes, roles, duties, incentives, and even promotion paths. All of these efforts will encounter resistance to change, and unless that resistance can be overcome, the change efforts will not take hold.

Finally, if lean transformation is viewed as a pure cost cutting initiative, it will encounter serious resistance from the workforce and will not lead to any long-term strategic improvements for the company. Recognizing that the gains achieved with lean transformation can help produce long-term capabilities and returns for the enterprise may be the most fundamental piece of knowledge that leadership needs to embrace in order to enable and accelerate lean enterprise transformation.