Lean Transformation of a Supply Chain Organization

By

Daniel Andres Walsh

Bachelor of Science in Chemical Engineering, Texas A&M University, 1996
Master of Engineering in Chemical Engineering, Texas A&M University, 1997

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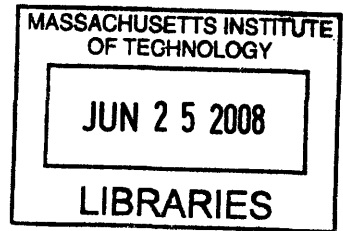
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Signature of Author_____
Department of Engineering Systems Division &
MIT Sloan School of Management
May 9, 2008

Certified by_____
Deborah J. Nightingale, Thesis Supervisor
Professor of Aeronautics & Astronautics and Engineering Systems Division

Certified by_____
Donald Rosenfield, Thesis Supervisor
Senior Lecturer, MIT Sloan School of Management

Certified by_____
Steven Spear, Thesis Supervisor
Senior Lecturer, Engineering Systems Division
Senior Fellow, Institute for Healthcare Improvement

Accepted by_____
Richard Larson, Professor of Engineering Systems Division
Chair, Engineering Systems Division Education Committee

Accepted by_____
Debbie Berechman
Executive Director of MBA Program, MIT Sloan School of Management

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ABSTRACT

There are two basic schools of thought regarding how to approach a Lean transformation. Either start with introducing Lean tools or start with driving a Lean cultural change. Academic researchers like Steve Spear (Harvard/MIT), Lean experts such as James Womack (Lean Enterprise Institute), and many Lean practitioners within the company believe that a "culture first" approach is more likely to create a sustainable Lean transformation rather than a "tools first" approach.

So, who is responsible for this "culture?" The leaders of an organization are responsible for the culture. Leaders drive cultural change through incentive systems, performance management, and role modeling. One critical tenant of Lean is the concept of *kaizen*, or making change for the better. *Kaizen* and continuous improvement applies to everyone, everywhere, everyday. This paper proposes that if one's approach to Lean is "culture first," then the leaders who own driving cultural change should *hansei* (personal introspection and reflection) and *kaizen* his or her own leadership behaviors and practices to ensure a successful Lean cultural shift for the organization.

Supply Planning Operations (SPO) decided to begin its own Lean journey in July 2007, and the transformation is still in its infancy. As part of the journey, the leadership team is reflecting on and comparing the group's leadership and management practices with those advocated by Lean experts. The team found that Toyota's leaders built an enabling bureaucracy to foster a high-performing learning organization. "Leading Lean" requires new approaches and behaviors that challenge existing group norms. This paper summarizes the gaps between SPO's current leadership norms and those identified by Lean experts. For example, SPO needs to continue developing their "people value stream" based on Lean organizational capabilities and healthy relational contracts between employees and management. These recommendations are not a prescription for success nor are they necessarily directly applicable to other groups. The intent of this thesis is *yokoten* (Toyota term for the horizontal transfer of information and knowledge) - to share SPO's current understanding of its leadership problems with others on the Lean journey.

Thesis Supervisor: Deborah J. Nightingale
Title: Professor of Aeronautics & Astronautics and Engineering Systems Division

Thesis Supervisor: Don Rosenfield
Title: Senior Lecturer, MIT Sloan School of Management

Thesis Supervisor: Steve Spear
Title: Senior Lecturer, Engineering Systems Division

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Lastly, I want to thank my classmates for their energy, companionship, and new ways of thinking. I truly hope we stay in touch as a class in the years ahead.

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1. Introduction

1.1. Background

As a researcher in the MIT International Motor Vehicle Program, John Krafcik observed that Japanese automobile manufacturers, namely Toyota, employed "lean" production systems that kept work-in-progress and finished inventory levels at a minimum while North American and European manufacturer production systems were "buffered" to compensate for variability and uncertainty.[1] Ever since Krafcik published this research in his 1988 paper, "Triumph of the Lean Production System," the research communities' understanding of "lean" production has continued to evolve. Toyota's management system has progressed as the company continues to learn through experimentation. Now twenty years later with Toyota poised to become the world's largest automobile producer, an increasing number of companies across industries and academic researchers are benchmarking Toyota's methods and practices. A diverse set of non-traditional manufacturing organizations from healthcare providers, financial services, software developers, and the pharmaceutical industry are adapting lean concepts and principles to environments beyond the factory floor. These organizations are using lean production techniques to remove waste, or anything that does not add value to the customer, from supply chains, office operations, business processes, and product development. Waste can take on a variety of forms from wasted materials, time, and human effort to variability and overloading people and equipment.

Jeffrey Liker, a Professor of Industrial and Operations Engineering, has studied the Toyota Production System and the Toyota Way for over twenty years.[2] In *The Toyota Way* Liker describes 14 principles that constitute the Toyota Way:

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[1] Krafcik, John F., "Triumph of the lean production system", Sloan Management Review, Vol. 30 No.1, 1988, pgs. 41-52.

[2] Liker, Jeffrey K. *The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer*, McGraw-Hill, 2004, pgs. 37-40.

Principle 1: Base your management decisions on a long-term philosophy, even at the expense of short-term financial goals.

Principle 2: Create a continuous process flow to bring problems to the surface.

Principle 3: Use "pull" systems to avoid overproduction.

Principle 4: Level out the workload (*heijunka*).

Principle 5: Build a culture of stopping to fix problems, to get quality right the first time.

Principle 6: Standardized tasks and processes are the foundation for continuous improvement and employee empowerment.

Principle 7: Use visual control so no problems are hidden.

Principle 8: Use only reliable, thoroughly tested technology that serves your people and processes.

Principle 9: Grow leaders who thoroughly understand the work, live the philosophy, and teach it to others.

Principle 10: Develop exceptional people and teams who follow your company's philosophy.

Principle 11: Respect your extended network of partners and suppliers by challenging them and helping them improve.

Principle 12: Go and see for yourself to thoroughly understand the situation (*Genchi Genbutsu*).

Principle 13: Make decisions slowly by consensus, thoroughly considering all options; implement decisions rapidly

Principle 14: Become a learning organization through relentless reflection (*hansei*) and continuous improvement (*kaizen*).

Some of these lean principles are not easy to apply or to adapt to non-factory settings. Because of dispersed teams and electronic inventory, launching a lean effort in a non-manufacturing setting has unique challenges. For example, group leaders in a factory can walk the line and "go and see" to thoroughly understand the situation with relative easy (*genchi genbutsu*). Walking the line is more challenging for many office-based group leaders that manage a team spread out across continents and time zones. Some Lean tools like visual management systems are also more difficult to use and not as effective when the *gemba* (the Japanese word referring

to where work or value creation occurs) is a desk in an office environment. In an office *gemba*, inventory often does not take the form of stacks of parts or work-in-progress (WIP) but rather emails and electronic data on a computer system. Based on the author's experience, it is difficult for many office managers to quickly realize when an employee becomes overloaded. When a worker or machine become overloaded in a factory, inventory begins to stack up or the line stops; however, in most offices the inventory and backlog are electronic and are often invisible to management.

This thesis uses the word "lean" in two ways. The capitalized term "Lean" will refer to the integrated principles, culture, and set of tools associated with the Toyota Production System and the Toyota Way. The purpose for capitalization is to draw a distinction between the noun "Lean" (i.e. the principles, culture, thinking) and "lean" which is commonly used as an adjective (i.e. lean tools and lean inventory) or implementing a "lean" change based primarily on tools.

1.2. Problem and Thesis Hypothesis

This thesis will focus on how to begin a Lean effort in a non-manufacturing based organization. This includes the challenges associated with cultural change and adapting Lean manufacturing concepts and tools to an office based organization. Edgar Schein describes three levels of culture: [3]

1) **What we see**: artifacts and behavior,
2) **What they say:** norms and value, and
3) **What they deeply believe and act on:** underlying assumptions.

In this context culture refers to "the pattern of basic assumptions that a given group has invented, discovered, or developed in learning to cope with its problems of external adaptation

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[3] Schein, Edgar. "Coming to a new awareness of organizational culture," *Sloan Management Review,* Winter 1984, Vol. 25, No. 2, pgs. 3-16.

and internal integration, and that have worked well enough to be considered valid, and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems."[4]

The hypothesis of this thesis is that w*hen trying to establish Lean within an organization, a "culture first" approach is more likely to create a sustainable Lean organization competency than a "tools first" approach.* Specifically, if leaders focus on changing the underlying assumptions and beliefs first before focusing on tools and artifacts, then the result will be a more sustainable Lean organizational change as measured by ongoing efficiency improvements through continual standardization and experimentation. Alternatively, if leaders focus on Lean tools and artifacts (e.g. *andon* cords, *kanbans*, and "5S" workplace housekeeping methodology) first before focusing on the underlying beliefs and values of the culture, then the organization will see some improvements in efficiency, but the effort will likely not be self-sustaining as measured by ongoing efficiency improvements through continual standardization and experimentation. The model shown in Figure 1 is contrasts these two approaches.
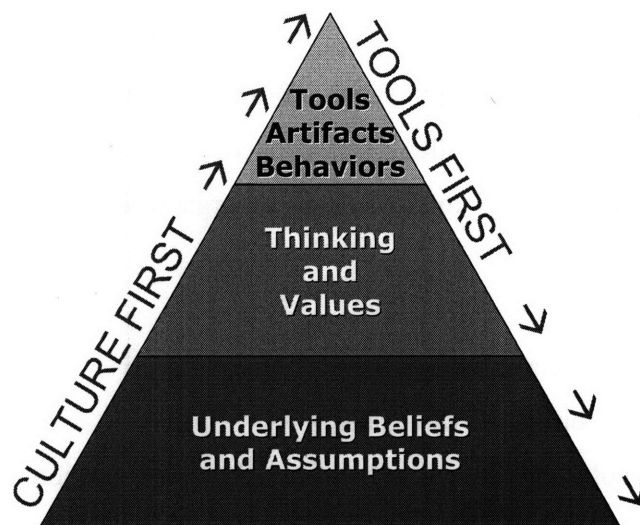
Figure 1: Culture First vs. Tool First Change Model (adapted from Schein's Three Levels of Culture)[5]

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[4] Schein, Edgar. "Coming to a new awareness of organizational culture," *Sloan Management Review,* Winter 1984, Vol. 25, No. 2, pgs. 3-16.

[5] Ibid.

This cultural change may take several years to take hold; therefore, the evaluation of whether the change is sustainable may also take several years. Because of this delay between action and outcome, this thesis will focus primarily on the challenges associated with how to begin a Lean transformation versus measuring the long-term results of the change.

1.3. Context

The hypothesis of this thesis is set within the context of a large, geographically dispersed, office-based organization. To help convey the significance of the cultural and leadership challenges associated with the Lean transformation, it is important to provide an overview and history of the company, Initech,[6] as well as some of the recent dynamics that have brought this effort to the forefront. Initech is a high technology manufacturing company comprised of about 85,000 employees. It has a large, global network of factories that produce a complex set of products for a diverse set of customers. Initech has a long history of excellence in technology development and manufacturing. Over the past decade, it has maintained roughly 80% market segment share despite intense rivalry and rapid product turnover. Initech's products and manufacturing processes are very complex.

At the time of this research, a couple of Initech's factories had been experimenting with lean manufacturing for a few years. A Total Productive Maintenance (TPM) effort that started in 1997 spread to many sites. TPM is an operator-driven preventive maintenance program and a continuing effort to adapt, modify, and refine equipment to increase flexibility, reduce material handling, reduce unplanned downtime, and promote continuous flow. Despite the widespread use of TPM, a more comprehensive Lean effort, beyond equipment maintenance, was not widely adopted by Initech.

Most Initech factories focused improvement efforts on safety, quality, output, and equipment utilization. Historically, the Initech factories operated in a capacity-constrained environment.

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[6] The company name and associated information is masked throughout the thesis.

Market demand frequently exceeded supply, so Initech's leaders designed systems and processes based on "if we built it - they will buy it" premise. Leaders structured factory incentives to maximize capital equipment utilization and often exceeded production quotas. By the end of 2006, Lean thinking had not progressed far beyond the confines of the two lead factories experimenting with lean manufacturing. Subsequent chapters describe the efforts of these two factories.

This thesis focuses on the Lean transformation of a supply chain organization called Supply Planning Operations (SPO). A Lean transformation is a fundamental cultural shift toward a Toyota-like learning organization where profitability, customer satisfaction, employee satisfaction, and supplier relationships are vastly improved. Liker describes 13 steps for driving a Lean transformation:[7]

1: Start with action in the technical system: follow quickly with cultural change

2: Learn by doing first and training second

3: Start with value stream pilots to demonstrate lean as a system and provide a "go see" model

4: Use value stream mapping to develop future state visions and help "learn to see."

5: Use *kaizen* workshops to teach and make rapid changes

6: Organize around value streams

7: Make it mandatory

8: A crisis may prompt a lean movement, but may not be necessary to turn a company around

9: Be opportunistic in identifying opportunities for big financial impacts

10: Realign metrics with a value stream perspective

11: Build on your company's roots to develop your own way

12: Hire or develop lean leaders and develop a succession system

13: Use experts for teaching and getting quick results

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[7] Liker, Jeffrey K. *The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer*, McGraw-Hill, 2004, pgs. 302-306.

SPO's primary objective is to develop a healthy supply chain in terms of customer responsiveness and cost while balancing increasingly tight headcount constraints. This organization is responsible for developing the tactical build plan of Initech's internal factory network. The group receives monthly demand forecast signals from sales, analyzes the current inventory position, and develops factory build plans for the zero to nine-month time horizon. The group has roughly 780 employees working in geographically dispersed offices around the world. The primary challenges of the organization are typical of a complex, modern supply chain, namely; demand forecast uncertainty, long manufacturing cycle times, and an increasingly complex set of product SKUs.

Lean concepts, such as minimizing waste in the form of inventory and waiting time, align well with the company's strategic objective for making the supply chain a competitive advantage by reducing inventory positions, improving productivity, and reducing planning cycle time. As a close partner with the manufacturing factories, SPO has observed the successful results of a Lean transformation within a couple of factories leading the Lean effort. These factories experimenting with Lean were able to reduce factory cycle time by 50% while improving quality metrics. By Q2 2007, SPO's leadership team had begun to discuss the efficacy of using Lean concepts within SPO. The work for this thesis began with securing the leadership team's commitment to being one of the first non-manufacturing organizations within the company to begin a Lean journey.

1.4. Organization of Thesis

This thesis is organized as follows:
- **Chapter 1** defines the problem and includes the background and context in order to provide a more complete view into the business and setting of the problem.
- **Chapter 2** contains a brief history of Lean and a history of Lean within the company.
- **Chapter 3** looks at how other organizations have used Lean in office settings.
- **Chapter 4** outlines the methodology used to transform the organization.

- **Chapter 5** is a summary of getting the leadership team commitment to begin a Lean journey.
- **Chapter 6** examines the challenges associated with leading a Lean transformation by comparing and contrasting the organization's current leadership norms with Lean leadership behaviors and practices as described by Lean experts.
- **Chapter 7** shows how the leaders drive cultural change and embed Lean practices within the organization.
- **Chapter 8** looks at why Lean Organizational Competencies and healthy relational contracts between management and employees are critical for a successful transformation.
- **Chapter 9** lays a foundation of future work for continuing SPO's Lean journey.
- **Chapter 10** concludes the thesis.

2. History of Lean

2.1. History of Lean

Some core concepts on which Lean is based are not new. For example, the concept of controlled experimentation dates back to Francis Bacon's work in 1590 when he popularized an inductive methodology for scientific inquiry. Another core concept, scientific experimentation, dates back to René Descartes' first scientific method published in 1637. Lean also extends upon many ideas from the major manufacturing systems of the 19th and 20th centuries. This includes Eli Whitney's system of interchangeable parts and design for manufacturing employed by U.S. Armories in the 19th century, Henry Ford's mass production system in the early 20th century, and Taiichi Ohno's Toyota Production System (TPS) developed from 1945 to 1975. Even elements more directly associated with lean like Just-In-Time (JIT) were "well known and adopted in the 1921-1929 time period."[8] As a result, the scope and boundary for what is commonly considered a "Lean" concept or practice is becoming increasingly blurred.

Jeffrey Liker's diagram in Figure 2 shows the main elements of the Toyota Production System (TPS) and how these elements fit to make an integrated system.[9]

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[8] Kenneth N. McKay, "The Evolution of Manufacturing Control - What Has Been, What Will Be" Working Paper 03 –2001, Memorial University of Newfoundland, 2001, pg. 10.

[9] Liker, Jeffrey K. *The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer*, McGraw-Hill, 2004, pg. 33.
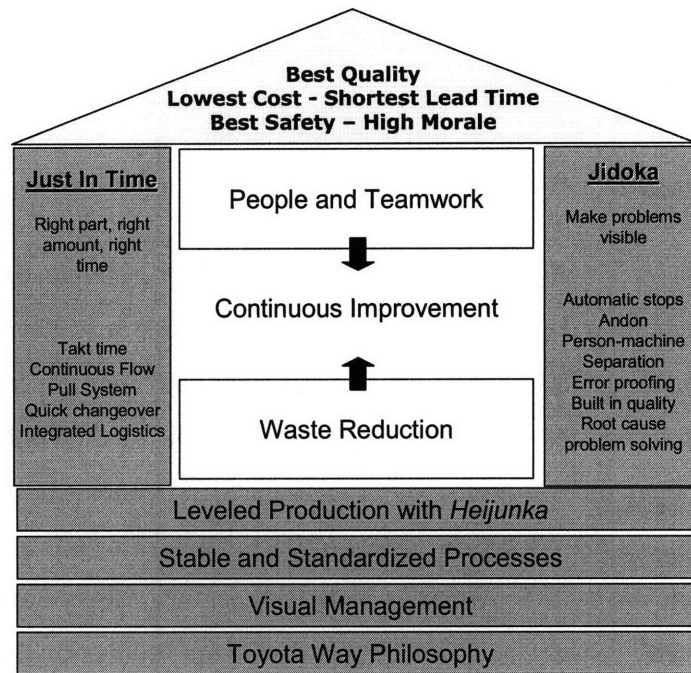
Figure 2: The Toyota Production System "Lean House" (adapted from *The Toyota Way*)

The two main principles or pillars of the Toyota Production System are Just-In-Time (JIT) and *jidoka*. JIT refers to the production of just the right amount of units at the just the right time. *Jidoka* or autonomation means automation with human intelligence. The purpose of *jidoka* is to separate human work from machine work and to improve quality by preventing products from flowing downstream if they are defective. Instead of sending defective material down the line, someone practicing *jidoka* would stop the line. As a result, problems are fixed immediately when and where they occur. TPS employs several tools to implement these two guiding principles including:

- pull system – dispatches production as needed to ensure JIT only when requested
- quick changeover – enables flexibility
- leveled production – level production in terms of mix and quantity over time
- stable and standardized processes – permits experimentation and workforce flexibility
- visual management – enables problem identification and management by exception
- worker involvement – encourages creativity and boosts morale
- continuous improvement – workers are a community of scientists constantly experimenting and improving work

In summary, Lean is a systematic approach to identifying and eliminating waste through continuous improvement by flowing the product at the pull of the customer in pursuit of perfection[10]. Lean practitioners strive to add the most customer value while consuming the fewest amounts of resources. Lean thinking gives everyone a shared way of "standardized thinking" and creates an environment of real-time learning nearest to the problem or point of impact. It encourages employees to act like scientists by continually experimenting on improving work.[11] Lean systematically drives out waste, creates more value for the customer, and enables the organization to do more with fewer resources.

2.2. The Fourth Age of Lean

The theory and understanding of Lean have continued to evolve since Womack, Jones, and Roos popularized Lean concepts in 1990 with *The Machine that Changed the World: The Story of Lean Production*. According to James Womack, founder and chairperson of the nonprofit Lean Enterprise Institute (LEI), the Lean movement is evolving from a "tool age"[12] to a new age focused on Lean management. Understanding this evolution helps explain why leadership is such a critical component of a Lean transformation. Below is a summary of Womack's Four Ages of Lean:

> **Age of Invention** (mid 1930's to mid 1970's) Toyota picks up where Henry ford left off with what he accomplished with flow production. "Toyota experimented with its product development system, its supplier management system, its customer relations system ... its fulfillment system from order to delivery, and then its management system that pulled all of that together."[13]

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[10] Womack, James P. and Daniel T. Jones, *Lean Thinking: Banish Waste and Create Wealth in your Corporation*, New York: Simon & Schuster, 1996.

[11] Spear, Steven, and H. Kent Bowen, "Decoding the DNA of the Toyota Production System," Harvard Business Review, September 1999, pg. 98.

[12] Womack, James, "2007 Lean Transformation Summit Speech", Lean Enterprise Institute, March 15, 2007.

[13] Ibid.

Age of Discovery (mid 1970s to 1990) Why are Japanese automobile production systems more efficient than those in North American and Europe are? Academic researchers like James Womack and Dan Jones and U.S. manufacturing competitors go to Japan to try to figure out what the Japanese are doing differently. They discover that "Toyota was a unique phenomenon, because they had a very clear management system that was actually different from typical Japanese management and most important one we [the U.S.] could copy."[14]

Age of Tools (1990's) *The Machine that Changed the World* tries to explain Toyota's new system versus traditional management by results. "All kinds of wonderful tools, 5S, setup reduction, *andon*, *kanban*, and indeed value-stream mapping … were tools that a lot of people took and tried to superimpose on a pre-existing management system."[15] Many companies see improvements by implementing Toyota's tools yet many fail to replicate Toyota's success fully.

Age of Management (mid 2000's) Researchers rethink Toyota's management system. "No process works for long unless people are truly engaged, and that's where management truly comes in."[16] Management needs to determine the customer purpose, identify and create a Lean process or value-stream, and engage and align the people. "We've not been very good at managing in a steady state way so that things get continually better … what we typically see is that process improvement is run by staff teams who come in for an intervention which makes things better …but we know that the half-life of improvement is depressingly short if it's not actually part of management."[17]

Womack's description of Fourth Age of Lean, The Age of Management, is consistent with a definition of "Lean" that encompasses a management system, set of principles, and culture as well as the commonly known set of tools eliminating waste and improving efficiency. This modern definition also aligns well with Steven Spear and Kent Bowen's research on why it has been so difficult to decode the DNA of the Toyota Production System. According to Spear and

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[14] Ibid.

[15] Ibid.

[16] Ibid.

[17] Ibid.

Bowen, the answer is "that observers confuse the tools and practices they see on their plant visits with the system itself."[18] Other researchers also view Lean as a complex system and not simply a set of efficiency tools. John Roberts characterizes modern Lean production as a system of complimentary elements where doing more of one element increases the returns for doing more of another element. Robert's description of modern Lean production in Table 1 encompasses a broad set of complimentary elements.[19] This modern definition of Lean that encompasses much more than a set of efficiency tools was the basis for discussions on the efficacy of using Lean within SPO. SPO's leadership team does not view Lean as just a set of tools to drive office and business process productivity. Lean represents a cultural shift and fundamental transformation for the organization.

Characteristic features of mass production	Characteristic features of Lean production
Logic: The transfer line, interchangeable parts, and economies of scale	*Logic: Flexibility, speed, economies of scope, and core competencies*
Specialized machinery	Flexible machines, low set-up costs
Long production runs	Short production runs
Infrequent product changes	Frequent product improvements
Narrow product lines	Broad product lines
Mass marketing	Target markets
Low worker skill requirements	Highly skilled, cross-trained workers
Specialized skill jobs	Worker initiative
Central expertise and coordination	Local information
Hierarchic planning and control	Self-regulation
Vertical internal communication	Horizontal communication
Sequential product development	Cross-functional development teams
Static optimization	Continuous improvement
Accent on volume	Accent on cost and quality
High inventories	Low inventories
Supply management	Demand management
Make to stock, limited communication with customers	Make to order, extensive communication with customers
Market dealings with employees and suppliers	Long-term, trust-based relationships
Vertical integration	Reliance on outside suppliers

Table 1: Characteristic Features of Modern Lean Production

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[18] Spear, Steven, and H. Kent Bowen, "Decoding the DNA of the Toyota Production System," Harvard Business Review, September 1999, pg. 97.

[19] Roberts, John. *The Modern Firm: Organizational Design for Performance and Growth,* New York, Oxford University Press Inc., 2004, pgs. 48-49.

2.3. History of Lean within the Company

Initech has a rich history of adding new manufacturing competencies to support changing corporate strategies. Figure 3 below is a rough timeline showing when Initech's factory network added new manufacturing competencies over the last several years. Older elements often support the introduction of newer competencies. For example, some elements of Lean already existed within the existing culture because of prior competency in the areas of fast time to market, cost focus, and defect reduction.
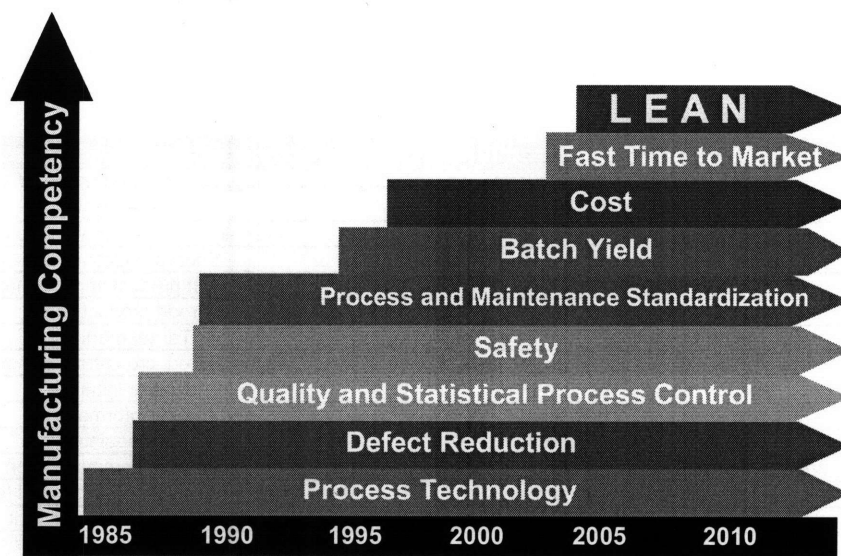
Figure 3: Company Manufacturing Competency Timeline

According to Wheelwright and Hayes' four-stage model on the strategic role of manufacturing, Initech's factory network most closely resembles the fourth stage where manufacturing contributes significantly to the company's competitive advantage (see Table 2). The ability of manufacturing to quickly ramp production to high volumes with high quality and predictability translates into a time-to-market advantage in a fast-paced competitive environment. With such a supportive and proficient manufacturing capability base, it was not surprising that Lean began to take hold within Initech's factory network first before spreading to other areas of the company.

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1	**Internally Neutral**	Minimize the negative effect of manufacturing
2	**Externally Neutral**	Achieve manufacturing parity with competitors
3	**Internally Supportive**	Provide support to the business strategy
4	**Externally Supportive**	Manufacturing contributes significantly to competitive strategy

Table 2: Wheelwright and Hayes Four-stage Model of Strategic Role of Manufacturing[20]

The Lean effort at Initech began with to two factories, which this paper will refer to as the Romulus and Remus sites.[21] Both factories primarily manufactured legacy products on mature equipment and process technology. Due to negative connotations associated with the word "lean" related to layoffs and factory rationalization, the Romulus and Remus factories labeled their Lean efforts Manufacturing Excellence or mX. The technical goal of Manufacturing Excellence (mX) was to understand how "pull" systems could improve the cycle times of complex process that had over 200 steps and contained several reentrant loops. The cultural goal of mX was to encourage all factory workers to eradicate waste systematically. Since the Lean transformation within Initech was initially led by the Remus site, the analysis of the history of Lean within Initech will begin with this factory.

The Remus factory began to experiment with Lean manufacturing concepts in early 2003 to drive improvements in cost and manufacturing cycle time. The factory experimented with reducing inventory levels to accelerate factory cycle time and experimented with 5S in many parts of the factory. The Remus site encountered setbacks at the beginning of the Lean effort due to a tool-centric approach to Lean. For example, an improvement suggestion portal that was supposed to help engage workers in waste elimination inadvertently revealed a scarcity of resources to support the surge in suggestions. Workers also invested a lot of time in creating detailed value-stream maps that yielded only common-sense conclusions.

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[20] Wheelwright, S. C., and R.H. Hayes, "Competing Through Manufacturing," Harvard Business Review, 1985, 63, 1, 99–109.

[21] The company name and associated information is masked throughout the thesis.

Frustrated by a lack of real progress, the Remus site chose to embrace a different Lean implementation strategy that deemphasized tools and focused on culture, principles, and the holistic, integrated Lean system. In late 2003, with the counsel of consultants from the Lean Learning Center, the Remus site chose to adopt a Lean transformation based on the four unspoken rules of the Toyota Production System as described in Spear and Bowen's paper, "Decoding the DNA of the Toyota Production System." A summary of these four rules that underlies Toyota's Production System are in Table 3.

#	Focuses on...	Rule
1	How Work Is Structured	All work shall be highly specified as to content, sequence, timing and outcome
2	How Work Connects	Every customer-supplier connection must be direct, and there must be an unambiguous yes-or-no way to send requests and receive responses
3	How Work Flows	The pathway for every product and service must be simple and direct.
4	How Work Is Improved	Any improvement must be made in accordance with the scientific method, under the guidance of a teacher, at the lowest possible level in the organization

Table 3: Four Unspoken Rules of the Toyota Production System[22]

The mX team at Remus also adopted five principles from the Lean Learning Center that help provide a common methodology and approach for establishing Lean behaviors within the workforce. These five principles were as follows:

1. Directly and deeply observe the work in question to understand the current reality

2. Systematically recognize and eliminate waste

3. Systematically solve problems through the scientific method

4. Establish high agreement on the what and how of the proposed change

5. Promote a learning organization that continuously learns, applies, and reflects on its change

Adapting the Lean or TPS house model used by other Lean companies, the mX teams developed a "lean house" under the guidance of the LLC consultants to help explain the

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[22] Spear, Steven, and H. Kent Bowen, "Decoding the DNA of the Toyota Production System," Harvard Business Review, September 1999.

interactions between the four rules and five principles. In this model shown in Figure 4, the four rules are the foundation for the five principles.

DIRECTLY OBSERVE WORK AS ACTIVITIES, CONNECTIONS & FLOWS

ACTION

Learn, Innovate and Improve

REFLECTION

SYSTEMATICALLY ELIMINATE WASTE

DETECT, CONTAIN & SOLVE PROBLEMS IMMEDIATELY

Strong Agreement of Both What and How

4 RULES
1. Activities: Structured and standardized
2. Connections: Clearly defined transfer of material and information
3. Flows: Specific and simple
4. Improvements: Small and rapid

Figure 4: The Company's "Lean House" Based on Four Rules and Five Principles

By early 2004, four Remus managers directing the mX initiative and devoted a significant amount of time to teaching and coaching others on the rules and principles of Lean. Two approaches were taken to drive the cultural shift. Some mX team members took an "inch deep and a mile wide" approach by rolling out basic Lean training across the entire factory. Other team members established Lean Learning Labs, or a model line, within a small part of the factory to experiment with Lean and deepen their knowledge and understanding in an "inch-wide and a mile deep" fashion. Employees on these pilot lines received extensive training and in depth coaching from Lean consultants. According to Spear and Bowen, the four rules enable the creation of a community of scientists experimenting on improvements to add more values with fewer resources.[23] This sentiment is reflected in a quote from one mX Core Team Leader:

"How often have we made a change, whether technical or organizational, and not known whether it actually solved a problem or better served our customer? How often have we

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[23] Spear, Steven, and H. Kent Bowen, "Decoding the DNA of the Toyota Production System," Harvard Business Review, September 1999.

rolled out a change as THE fix? How much more powerful would it be to roll out all changes as controlled experiments, acknowledging that we will continue to improve upon them, or even totally abandon them if something better is discovered? Would people be more accepting of change if they knew that all change is an experiment, and that each new activity, connection or flow will be scrutinized for effective and efficient delivery of results? And that they were empowered to make changes to the change?"

The Remus factory also experimented with other aspects of Toyota's Production System. They strove to improve manufacturing equipment utilization through a High Precision Maintenance (HPM) program based upon the Toyota's Total Productive Maintenance program. In 2005, they also began to experiment with Work-In-Progress (WIP) management policies to reduce inventory levels and increase factory cycle-time. All of these efforts began to show remarkable results by 2006 through the achievement of cost, quality, and cycle time records. Figure 5 shows how the Remus factory increased WIP turns by four-fold to world-class WIP velocity performance levels.

Inventory Turn Performance
2006 to Mid-2007
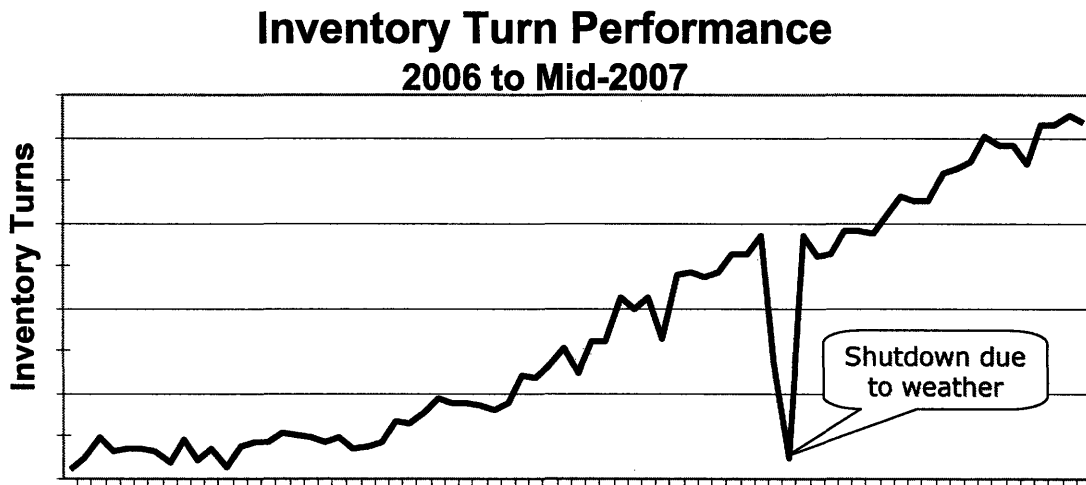
Figure 5: Remus Factory Inventory Turn Performance

Unfortunately, much like the ancient Roman character, the life of the Remus factory was short-lived. Due to Initech divestitures and falling demand for specific products, Initech senior management decided to rationalize the Remus factory and shut it down by the end of 2007. Fortunately, the other factories in the network witnessed Remus' remarkable accomplishments using Lean thinking and decided to continue the Lean journey that the Remus factory had begun.

Having experienced similar failures due to an early emphasis on Lean tools, in late 2006 the Romulus factory embraced Remus' "culture first" approach to Lean. After Romulus duplicated Remus' cycle time results, most of the remaining factories in the network followed suit and began their own "culture first" Lean journeys. Lean consultants employed by the two leading plants, in person tours, and a few lessons learned documents were the primary means for transferring knowledge from Remus and Romulus to the other factories. Figure 6 shows how the factory network reduced cycle times by at least 50% over the past 15 months.

Factory Network Cycle Time Performance Trends 2006 To Early 2007
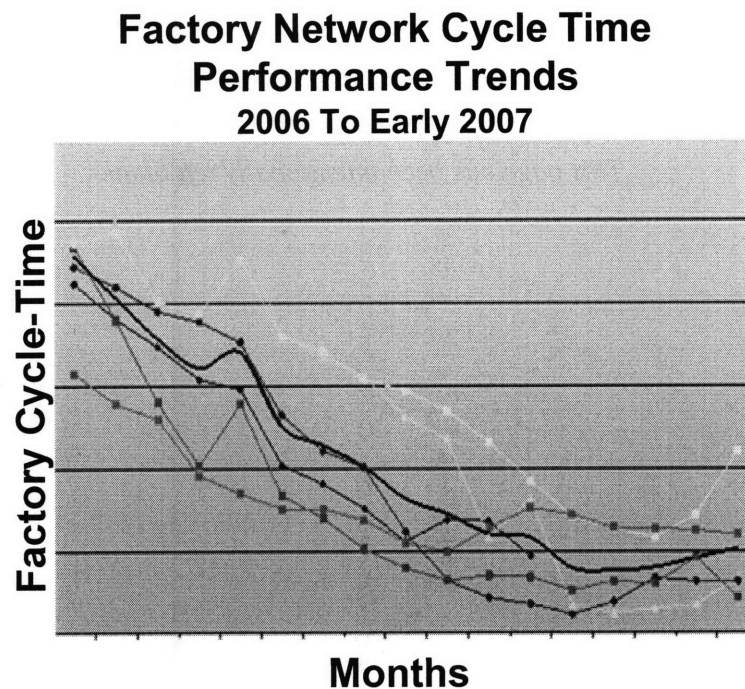
Figure 6: Cycle Time Performance Trend of the Factory Network

In addition to the factory network, one or two other organizations began to experiment with lean tools in 2006. Initech's Materials organization made the most progress; however, much like the early efforts of Romulus and Remus, the Materials group emphasized the use of lean tools in conjunction with six-sigma tools. As a result, they did not fundamentally change the culture and establish a new organizational competency for finding and fixing problems through experimentation. In July 2007 the Supply Planning Operations group began a Lean journey based on a "culture first" approach to Lean, which is the focus of this thesis.

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3. Lean in Office Settings

3.1. The Expanding Scale and Scope of Lean Thinking

Today, Lean thinking has transcended the traditional manufacturing factory settings, and an increasingly diverse set of industries are using Lean in non-manufacturing environments. Collaborative efforts like the Lean Advancement Initiative (LAI) at MIT, which includes members from industry, government, and academia, are expanding the scope of Lean thinking, products, and tools related to Lean enterprise transformation. In addition, nonprofit organizations like the Lean Enterprise Institute (LEI) are also promoting and advancing the principles of Lean thinking in every aspect of business and across a wide range of industries. An expanding group of industries from healthcare to software development is embracing lean thinking. Toyota and other companies that have embraced a Lean culture are extending the range of Lean applications and are adapting Lean to business process improvements, product development, and engineering standard work. Figure 7 is a representative model for how Lean has continued to expand in scale and scope over the last couple of decades.
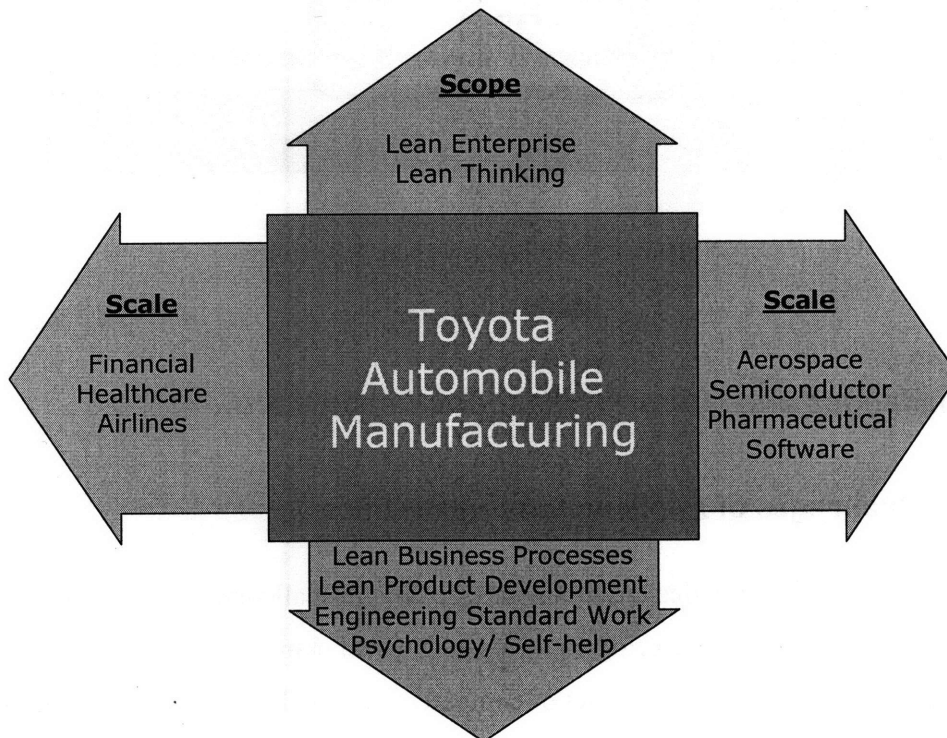
Figure 7: Expanding Scale and Scope of Lean

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One example for how Lean thinking transcends the factory and traditional manufacturing is Spear and Bowens' rules-based framework that underlies Toyota's Production System. These four rules for how work is structured, how work connects, how work flows, and how work is improved along with the concept of *jidoka* (automation with human intelligence) are applicable to a wide variety of work in offices, hospitals, and even software development firms. For example, Figure 8 shows how the four rules relate to a high-level order-to-delivery value stream process that SPO helps to manage within Initech. Many other principles within the Toyota Way like Respect for People and Continuous Improvement are also important principles for many other successful companies like Southwest Airlines, Vanguard, and Alcoa.
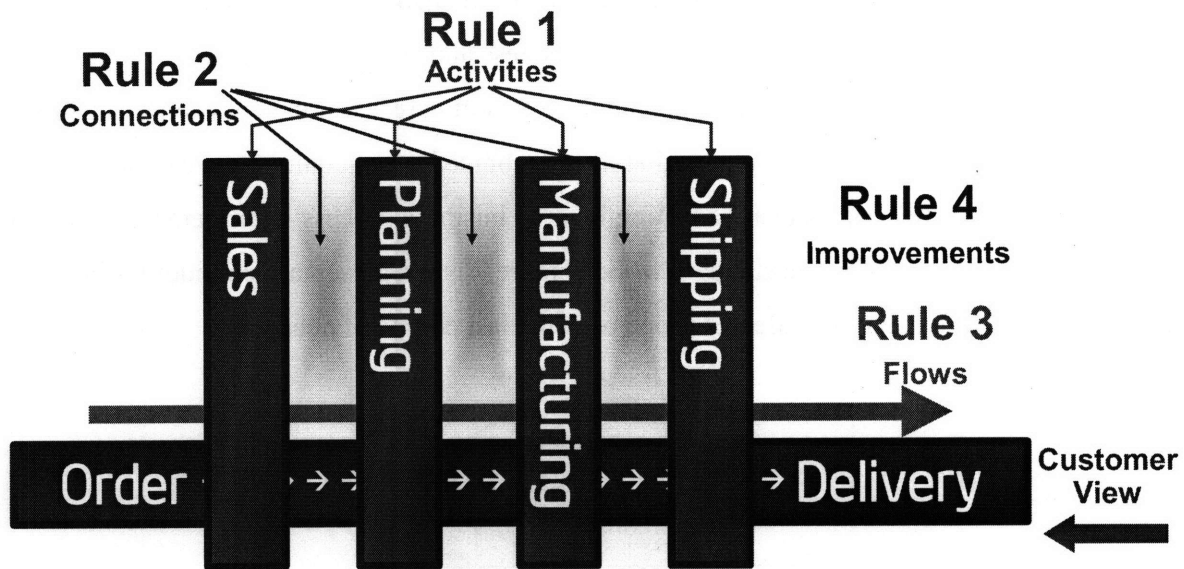
Figure 8: Process View of the Four Rules

3.2. Challenges and Opportunities for a Lean Office

3.2.1. Challenges of Applying Lean in an Office

Knowledge workers in an office environment face unique challenges when adapting and applying certain Lean manufacturing concepts, like visual management systems, to a workplace where inventory can be a set of computer files and business processes are largely electronic in nature. In an office setting, there is often no physical inventory and problems are

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harder to identify when they arise because they are not readily visible. Communication constraints can also limit team effectiveness when members live in locations dispersed across the globe.

3.2.2. Advantages of Applying Lean in the Office

Despite these and other challenges, there are several arguments for why adopting and embracing Lean thinking in the office is worth the effort. Jon Miller from Gemba Research argues that companies should start a Lean journey in the office in parallel with the factory. There are several advantages to this parallel approach:[24]:

- Gives the Lean manufacturing effort more credibility and sends a clear message that no one gets a free pass from Lean thinking
- Unleashes the experience and creativity of the people in the office to solve all kinds of problems for the factory and for customers.
- Helps the finance people understand Lean so that they will change both how they do accounting and how *kaizen* (to make a change for the better) activities are chosen
- Involves customers and suppliers sooner in the Lean process, since the office people often have more direct contact with them.
- Reducing the information flow lead-time is often a low-hanging fruit that improves cash flow and time to market.
- Avoids spending millions on IT by having IT specialists, users, and decisions makers understand process flow first by mapping it out and then by redesigning it.
- The people paid the most can spend less time in meetings and more time at the gemba and with the customer.

Kaufman Global, another consulting group, claims that Lean, stable micro-processes, or small business processes, can translate into a competitive advantage for a company. Much like the subtle, detailed operational aspects on a manufacturing floor, micro-processes are difficult or impractical for competitors to copy. For example, relocating a parts bin from one side of a

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[24] Miller, John. "The Top 10 Reasons to Start Lean Office and Lean Manufacturing at the Same Time," Gemba Research Inc., 2007.

work cell to another side may eliminate wasted motion. However, since competitors do not have the exact same cell layout, there is little or no benefit for replicating this change. Similarly, companies have thousands of micro-processes that are unique to their own systems that are not applicable or appropriate in a competitor's context.

Another reason to apply Lean in the office is that Lean business processes with clearly structured activities, direct and unambiguous connections, and simple linear flows create a stable foundation for larger process changes. Proliferating larger macro and mega-process changes, such as new information technology systems, are likely to encounter fewer problems if they land on a stable foundation of micro-processes. If the micro-processes are well defined and understood, IT system architects and designers of new mega-processes can better predict potential problems and solve them before launching a new program. Kaufman Global uses the following model to explain this phenomenon for how stable micro-processes translate into a competitive advantage for Lean companies.
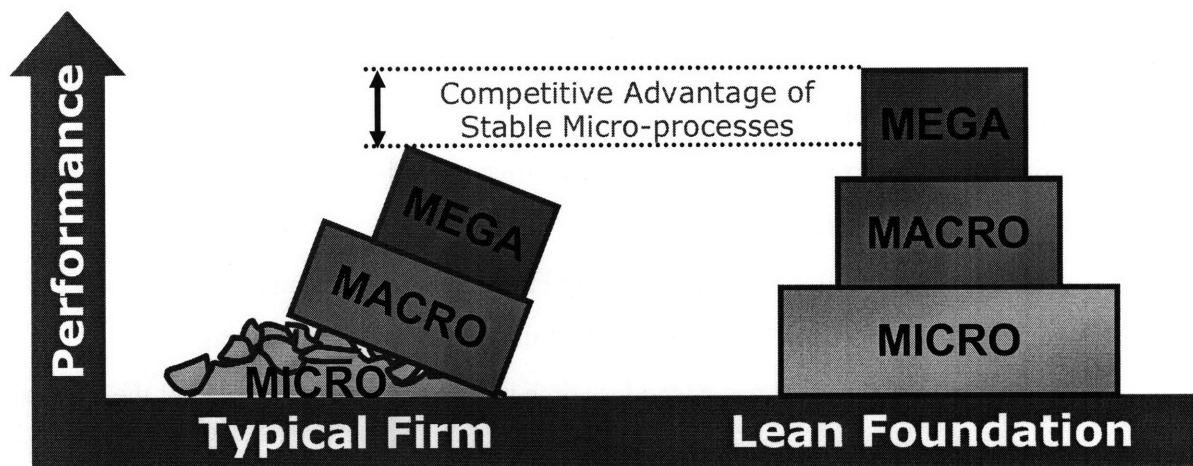
Figure 9: Competitive Advantage of Lean Micro-processes (adapted from Kaufman Global)[25]

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[25] Kaufman Global, LLC. "Office Kaizen: Making Lean Work in Service Environments, A Kaufman Global White Paper," from http://www.kaufmanglobal.com, July 2007.

3.3. Survey of Lean Office Techniques

Some believe that adapting Lean manufacturing to an office environment entails the development of a fundamentally new set of tools, techniques, and methods. As argued previously, it is the opinion of the author that this is not the case. Lean concepts, principles, and ways of thinking are transferable and applicable in an office setting. One example of a company transferring Lean thinking to an office setting is Agilean Corporation, a Lean office consulting firm. The Agilean's Lean office techniques[26] that follow are essentially the same traditional Lean manufacturing techniques for defining the value stream, creating standard work, establishing takt-time, eliminating waste, defining customer focused metrics, and enabling cross-training.

- Clearly define the customer value being created along with the tasks and resources necessary to create that value *(define value and the value-stream)*
- Standardize procedures to eliminate variability errors and make it easier for multiple people to perform the same job *(standard work)*
- Establish a common tempo to regulate the continuous flow of work *(takt-time)*
- Place each task of a process as close together as possible, along with the resources needed for each task *(waste elimination)*
- Define performance levels so employees know the next highest priority task to perform *(customer focused metrics)*
- Create job flexibility so all employees can work the highest priority tasks company-wide *(cross-training)*

Analogous to these Lean tools, Lean office principles are also fundamentally the same as Lean manufacturing principles. One example of transferring Lean principles to the office comes from Gemba Pant Rei, a Lean consultant. Gemba's Lean office principles[27] that follow are in essence the same Lean manufacturing principles for setting production targets (takt time), value-stream mapping, visual management, and the elimination of waste.

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[26] Agilean Corporation. "The Lean Revolution," from http://www.agilean.com/lean_revolution_article.htm, February 2008.

[27] Miller, John. "Getting Started with Lean in the Office," Gemba Research, http://www.gembapantarei.com/2007/09/getting_started_with_lean_in_the_office.html, September 2007.

- **Make today's work visible.** How many calls must we make or take today? How many pages must be written, checked or submitted today? If it is not clear what work everyone needs to finish on a given day of work, there is no way to measure objectively whether the day was a success or not, and why. *(setting production targets)*

- **Make the process visible.** How does the work flow? Where is the work done? Where can it be done? Who can do the work? *[value-stream mapping]*

- **Make the status visible.** Where is the work now? Is it ahead or behind? This should be immediately apparent in a Lean office. If it requires meetings, or if you have to ask, you are not managing visually. *[visual management]*

- **Make the waste visible.** As a general rule, anything that gets in the way of doing today's work is waste, variability or overburden, and needs to be removed. *[elimination of waste]*

A few traditional Lean manufacturing concepts require some adaptation for the office environment. For example, waste in an office *gemba* often takes forms different from those found in factory settings. Office settings typically have little to no transportation waste and often have a lot of information related waste. Unnecessary paperwork, missed phone calls, data translation errors, and poorly run meetings with too many participants are all forms of office waste that are not typically associated with manufacturing factories. Taiichi Ohno, often sited as the father of the Toyota Production System, created the following framework for identifying seven types of waste that he saw on factory floors[28]:

- Waste of overproduction
- Waste of time on hand (waiting)
- Waste in transportation
- Waste of processing itself
- Waste of stock on hand (inventory)
- Waste of movement
- Waste of making defective products

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[28] Ohno, Taiichi. Toyota Production System: Beyond Large-Scale Production. Portland, OR: Productivity Press, 1988, pgs. 19-20.

While it is possible to categorize office waste using this structure, other schemes designed with the office *gemba* in mind yield more insightful findings. Lean consultants from Kaufman Global have created one such scheme designed for the office (see Figure 10). People energy waste results from a failure to harness an employee's potential. People work wastes are similar to the waiting, motion, and over-processing counterparts found on a factory floor. Process wastes are the wastes from inefficient structure, interaction, and execution of complex business processes. Lastly, information wastes arise from inefficient data flow between activities and across connections. Knowledge workers in an office setting can closely relate with this categorization scheme for waste because they see these forms more often than Ohno's factory-based forms of waste.
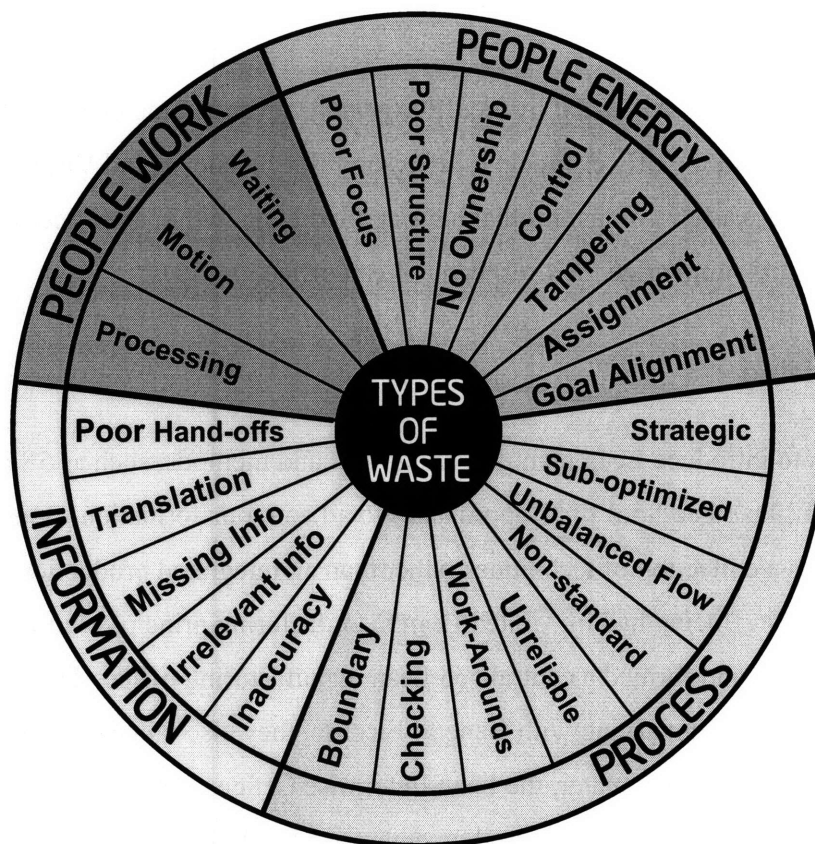
Figure 10: Forms of Lean Office Waste (adapted from Kaufman Global)[29]

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[29] Adapted from Kaufman Global, LLC. "Office Kaizen: Making Lean Work in Service Environments, A Kaufman Global White Paper," from http://www.kaufmanglobal.com, July 2007.

3.4. Review of Successful Lean Office Transformations

If Lean office tools and principles are the same as Lean manufacturing, then why is creating a Lean office a challenge? One answer lies in the *gemba* of the office. In the *gemba* of an office, inventory typically is not physical but rather electronic in nature. This sometimes makes it difficult to make problems visible, which slows down the improvement processes. Modern forms of communication (i.e. email, texts, calls, and instant messages) also frequently interrupt workers in an office. These interruptions slow down processes and increase the probability for human-error. Interruptions also help to create a culture for tolerating unpredictable and unmeasured process cycle times because of the high variation they induce. This makes experimentation difficult because the baseline condition for business processes is not well understood, characterized, or followed.

Even with these problems induced by an office *gemba*, several companies have successfully implemented Lean in the office. Boeing, Jefferson Pilot Financial, and Virginia Mason Medical Center are a few companies that have applied Lean within an office setting. The following sections summarize their respective Lean office journeys.

3.4.1. Boeing

Boeing began to introduce Lean manufacturing tools and methods, such as 5S and JIT, in 1992.[30] Much like other "tool first" approaches to a Lean transformation, Boeing initially viewed Lean as a collection of techniques rather than an integrated production system. However, by 1996 Boeing had integrated Lean manufacturing principles into a coherent production system and formed a centralized Lean manufacturing office. Due to Boeing's close collaboration and benchmarking with General Electric, they also launched a formal six-sigma program in 1999. Two years later, the Lean Enterprise Office absorbed the six-sigma program. Boeing's Lean Enterprise Office focused on enterprise level inefficiencies in the connections between design, manufacturing, and supplier management.

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[30] Leitner, Pilla A. "The Lean Journey at the Boeing Company," ASQ World Conference on Quality and Improvement Proceedings, Vol. 59, 2005, pg. 269.

In 2005, Boeing executives launched the Lean+ initiative. Lean+ is a cultural change or a cultural evolution and was one of four initiatives that Boeing's leadership hoped would boost productivity and growth. One objective of Lean+ was to build upon Boeing's already excellent Lean manufacturing practices by moving them into offices and back shops. When asked if a factory-based initiative such as Lean was applicable to other environments Alan Mulally, at the time president and CEO of commercial airplanes responded: "Absolutely! Lean thinking and Lean principles can improve our performance everywhere. And we do have areas today beyond production where Lean is working. We want to spread it even broader and take it to the next level of performance."[31] Lean+ focused on enabling and encouraging relationships and working together more closely as one Boeing Company rather than separate entities. It advocated sharing best practices and learning from one another. Another critical element of Lean+ is leadership. One employee writes, "Typically in organizations where Lean has become a way of life, you will find a trail of strong leadership embracing, believing in and creating the sustained culture of continuous improvement. We all need to step up as leaders to spread this culture and make it a way of life."[32]

In support of the company wide Lean+ initiative, several office-based groups began to adopt Lean. They developed a class that revolved around an exercise in which teams identify and implement improvements to reduce cycle time within simulated business processes and trained over 400 Lean+ practitioners. By getting employees involved in creating solutions, one finance team was able to reduce the process time for computer work authorizations by 75% while reducing errors by 99%.[33] When asked about managing internal demand for a group's services, Rick Gross, leader of Boeing's Internal Services Productivity Lean initiative said,

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[31] *Boeing Frontiers*. "Initiative: Lean+," Vol. 4, Issue 6, February 2006, from
http://www.boeing.com/news/frontiers/archive/2006/february/cover2.html
[32] Schnettgoecke, Bill. "Lean+: supporting the businesses," Boeing Frontiers, April 2006, from
http://www.boeing.com/news/frontiers/archive/2006/april/i_nan1.html
[33] Kim, Junu. "Valuable Connection," *Boeing Frontiers,* August 2007, pgs. 22-23 from
http://www.boeing.com/news/frontiers/archive/2007/august/cover03.pdf

"If I'm a Finance employee I need to work with my program manager, business partner or site leadership to show them what they're consuming in financial services—things like cost performance reports or integrated scheduling updates. Then I can facilitate a hard conversation around, do you really need that much support at that frequency custom-tailored to meet every need? Or can your needs be met with more standardized services at lower cost and variability? There's a level of managing our internal business partner's expectations regarding requirements and ensuring competitiveness of our support/services. Our challenge is to provide quality service at more affordable rates year over year. What we're trying to achieve in the office is a fundamentally different way of operating and thinking about what we do. We should think like we're delivering products and services. We need to take up the competitiveness drive around maximizing value for the customer. Then we need to turn that to an internal conversation between support groups and the people they provide their services to, with the fundamental basis of creating value through improving productivity and managing demand. That will become a key competitive discriminator for Boeing."[34]

There are a few key lessons that Initech can take away from Boeing's Lean journey. Much like other companies, Boeing struggled for several years when they focused on Lean tools. After they established a fully integrated production system in manufacturing, they realized they needed to make the effort company wide in order to take their Lean journey to the next level. For this expansion to office-based groups, Boeing now took a different approach toward Lean transformation. This company-wide initiative called Lean+ was a "culture first" approach to Lean that adapted Lean thinking, principles, and tools to office environments.

3.4.2. Jefferson Pilot Financial

Jefferson Pilot Financial was another firm that successfully adapted Lean to an office setting. Jefferson Pilot Financial (JPF) is a full-service life insurance and annuities company that manages $31B in assets and employs approximately 3,700 people.[35] After surveying their independent life insurance advisors in 2000, the management team decided that superior service was a key strategy for increasing market share. JPF then conducted an extensive analysis of its operations to determine where improved service would have the greatest impact. The analysis concluded that there was considerable variation in their service quality. For

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[34] Boeing Frontiers. "Smart Move," November 2007, pgs. 12, from
http://www.boeing.com/news/frontiers/archive/2007/november/cover.pdf

[35] Swank, Cynthia Karen. "The Lean Service Machine," Harvard Business Review, October 2003, pg. 123.

example, a new policy requiring a physician's statement could take between one and two months to complete and due to errors 10% of the policy applications required rework. There was also variation in the cost to issue a new policy between JPF's two primary locations in North Carolina and New Hampshire. Management estimated that it could increase the premium for its independent life insurance advisors by 10% to 15% and reduce errors to 1% if JPF could issue all policies within three weeks.

In 2000, JPF decided to launch a Lean Office initiative. Management regarded operations much like a manufacturing line with the processing of an almost tangible service product through several business process steps. With the help of lean consultants, JPF established segregated model lines or pilot lines to allow employees to conduct experiments and fix problems without jeopardizing all operations. Employees used standardized work techniques to improve their work activities and make coverage plans for absent employees more manageable. They also reduced waste and improved connections in the value stream by relocating connected employees next to one another. By locating employees closer to their downstream 'customers' and upstream 'suppliers', employees developed a more acute awareness that they were part of an integrated whole value stream. JPF improved the flow of work in the model line by implementing takt-time, workload leveling, and eliminating loop-backs. In parallel with making changes to the model line, managers established and made visible a set of Lean metrics that incorporated both individual and team performance goals.

Having achieved success in the model line, the company expanded Lean to the rest of the company. During the rollout, the team realized that to ensure effective knowledge transfer to employees, the leadership team needed to communicate both the "why" of Lean thinking as well as the "how." Within two years, JPF was achieving remarkable results with Lean. JPF reduced application receipt to policy issuance cycle time by 50%, reduced labor costs by 26%, and reduced the errors by 40%. This translated to a 60% increase in premiums.

3.4.3. Virginia Mason Medical Center

Lean is not typically associated with healthcare where waste and costs have risen significantly over the last several decades. However, though the efforts of Lean experts at institutions like

the Institute for Healthcare Improvement this perception is changing. The following example on Virginia Mason is further evidence that Lean thinking transcends the traditional manufacturing setting.

Virginia Mason Medical Center (VMMC) located in Seattle, Washington, is a non-profit hospital with 400 doctors, 5,000 employees, and 336 beds.[36] Virginia Mason's Lean journey began serendipitously in 2001 when J. Michael Rona, president of Virginia Mason Medical Center, struck up a conversation with the man seated beside him, John Black, on a flight home. At the time, Black was director of Lean manufacturing at Boeing. By the time the flight landed, Rona was convinced that Lean manufacturing could help turn his hospital around. After convincing the board of directors to embrace Lean, hospital leadership adopted the following principles:

- Customer is ALWAYS first
- Commitment from every employee to inspect and provide the highest quality
- Obsession with Safety
- Strive for highest staff (employee) satisfaction
- When combined – this results in a highly successful economic enterprise

In June 2002, approximately 30 of the Virginia Mason's top leaders dove into a two-week long TPS immersion in Japan. A couple of months later, the "Virginia Mason Production System (VPMS)" was officially the bedrock of the hospital's strategic plan to improve quality and drive down costs. The leadership team adopted the motto "The patient is God" and began to reorganize teams and change the culture to serve the customer and NOT serve the process. Leadership mandated a Lean cultural shift for all employees with a "get on the bus or be under the bus" mentality. Staff was strongly 'encouraged' to adopt Lean or choose another place of employment. Executive management did not tolerate late adopters. All managers from the assistant director level up were required to attend seven daylong training sessions over six

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[36] Virginia Mason Medical Center web site: https://www.virginiamason.org/home/body.cfm?id=120, from February 2008.

months to earn a VMPS workshop leader qualification. The VMMC leaders then instituted a no-layoff policy to alleviate fears that a laborsaving initiative may result in the loss of jobs.

With the VMPS in place, the hospital employees began to transform into a community of scientists experimenting on and improving work practices in the hospital to serve the patient better. For example, management moved cancer patients to the doctors' window offices with light and nice views. The doctors, nurses, social workers, and support staff moved to the center spaces within the hospital to promote teamwork and communications. Through experimentation, doctors reconfigured their offices into U-shaped production cells with the patient rooms nearby. In this configuration, doctors could easily visit file cabinets, patients, and other interior routes to meet with employees. Doctors also adopted standard work practices for activities each doctor is supposed to execute immediately after a patient visit. This standard doctors' work included[37]

- Fill out a charge slip for the visit
- Document the visit
- Respond to at least one routine e-mail message from the medical assistants who answer the clinic's telephones (the role of "advice nurse" has been eliminated by linking them directly to the doctors)
- Answer at least one urgent message
- Read and reply to at least one piece of hard-copy mail
- Fill out at least one result report
- See the next patient

VMMC also experimented with the principle of *jidoka* and created a Patient Safety Alert System. Employees embraced *kaizen* by driving change through the Everyday Lean Idea System. They also developed a Kaizen Promotion Office War Wall to show the current improvement plans and help drive change. VMMC has completed more than 500 *kaizens* over the past five years, and they now average about one every week. VMMC also adapted an *andon* system to a hospital setting. A Patient Safety Alert system empowered all employees to

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[37] Weber, David Ollier. "Toyota-style Management Drives Virginia Mason". *Physician Executive*, 32(1), 15, 2006.

shut down the line or the business process when there was a problem. Like *andon* systems in a factory, this encouraged immediate problem solving where the problem was occurring.

To sustain the effort, every other year a team of senior managers visited Lean firms in Japan for deeper immersion into a Lean culture. This team worked at a Lean plant side-by-side with the factory members to learn how to implement small and rapid changes. VMMC leadership also continually reinforces Lean through visible, regular, and mandatory attendance of mid-week check-in meetings. A dedicated Lean team was established, and they help communicate the hospital's Lean model through a Lean house (see Figure 11).
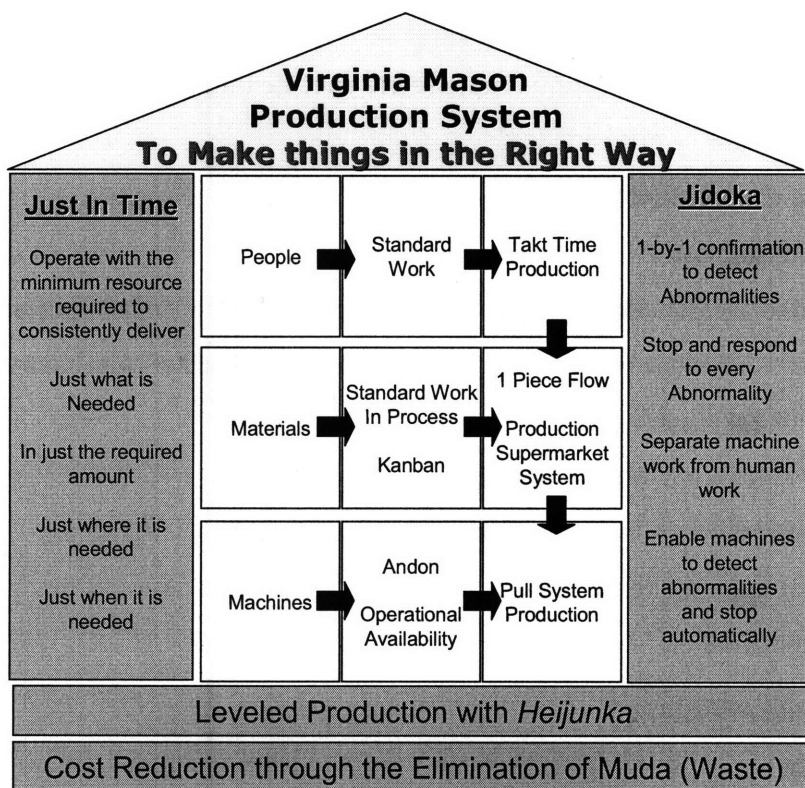
Figure 11: Adapted from Virginia Mason Lean House[38]

Applying the principles of Lean has vastly improved Virginia Mason's financials and productivity despite a no-layoff policy after only two years of effort.[39] Despite this

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[38] Johnson, Todd. Virginia Mason Production System: The LEAN Supply Chain at Virginia Mason, Overview for HIGPA, October 25, 2005, from http://www.higpa.org/pdf/ToddJohnson.pdf, accessed February, 2008, pg. 9.

improvement, VMMC leadership views Lean as a journey that will never end in pursuit of perfection for the patient. The hospital's vision is to be quality leader in healthcare. Lean and the VMPS is the foundation of VMMC's strategy to achieve this vision. To communicate the VMMC strategy to all employees, management created a strategy pyramid showing how the mission, vision, and VMPS relate and build on one another (see Figure 12).
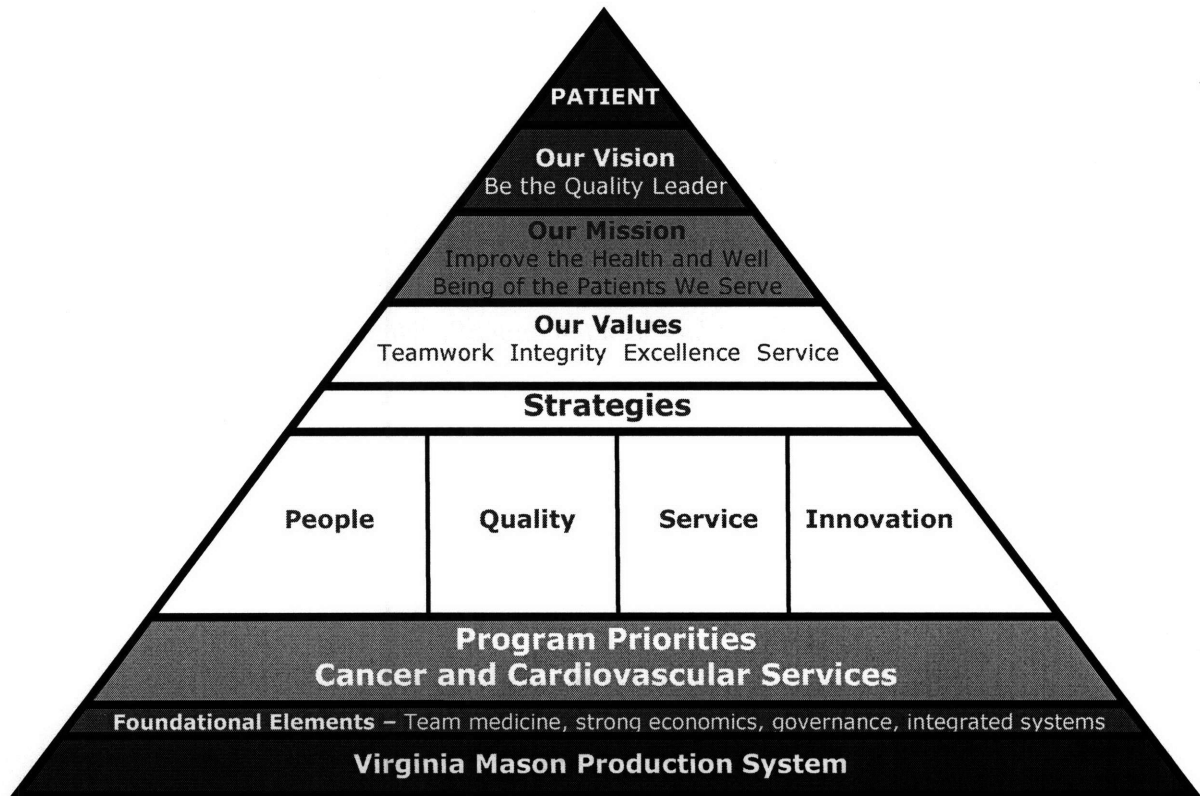
Figure 12: Adapted from Virginia Mason Quality Strategy Pyramid[40]

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[39] Institute for Healthcare Improvement. "Going Lean in Healthcare" *IDS Hospital Management - White Paper*, from http://www.ids-healthcare.com/Common/Paper/Paper_51/Going%20Lean%20in%20Health%20Care1.htm, from February 2008.

[40] Institute for Healthcare Improvement. "Going Lean in Healthcare" *IDS Hospital Management - White Paper*, from http://www.ids-healthcare.com/Common/Paper/Paper_51/Going%20Lean%20in%20Health%20Care1.htm, from February 2008.

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4. Methodology

There are two basic schools of thought regarding how to approach a Lean transformation. Either start with introducing Lean tools or start with driving a Lean cultural change. As stated previously, the working premise of this thesis is that when trying to establish Lean within an organization, a "culture first" strategy is more likely to create a sustainable lean organizational competency than a "tools first" strategy. Academic researchers like Steve Spear (Harvard/MIT), Lean experts such as James Womack (Lean Enterprise Institute), and most Lean practitioners within Initech believe that a "culture first" approach is more likely to create a sustainable Lean transformation than a "tools first" approach. There is also evidence of companies that have been on a Lean journey for a while that are re-designing their efforts with a focus on adopting a "culture first" approach. Boeing's Lean+ initiative is one example of their renewed focus on Lean culture.

The "culture first" Lean transformation strategy for Initech's Supply Planning Operations organization contained four high-level steps:

1) Leadership commitment - Secure a commitment from the leadership team to begin a Lean journey and fundamentally change the culture of the organization.
2) WHAT is leading Lean? - Educate the leadership team on Lean concepts and principles and advise them on adopting Lean leadership behaviors and practices.
3) HOW do leaders drive change and embed a Lean culture?
4) WHY are Lean organizational capabilities and healthy relational contracts critical for continuous improvement and respect for people?

Each of these steps will be described in the following chapters of the thesis. While step one was first chronologically, the remaining steps overlapped as the organization learned about and experimented with Lean thinking.

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5. Securing Leadership Commitment

If the working premise of this thesis is a "culture first" approach to Lean transformations, then who is responsible for this "culture?" Culture in this context refers to the way things are within an organization. Therefore, what changes the culture most: mission statements, the company vision, leaders, employees…? The leaders of an organization drive the culture and create meaning by establishing a consistent system of values. Very few Lean transformations are successful without having the up-front commitment of senior leadership.

Fortunately, securing the commitment for a Lean transformation from the head of Supply Planning Operations (SPO) at Initech was straightforward. As mentioned previously, a couple of Initech's manufacturing factories had been experimenting with lean tools and methods for the past few years. One factory was seeing breakthrough performance by embracing a Lean culture. SPO's leadership team observed the improved factory cycle and began having preliminary discussions regarding lean in early 2007.

As a Leader's For Manufacturing (LFM) alumni, the leader of SPO was familiar with Lean, six-sigma, theory of constraints, and other operational excellence techniques. After a couple of discussions regarding the applicability of Lean within SPO, a face-to-face meeting was held to convey the significance of beginning a Lean journey and align on the need to change the culture of the organization. Once the leader understood the potential risks and benefits of embracing Lean, he committed that the SPO leadership team would explore beginning a Lean journey.

Based on the author's observation, a majority of Initech's leaders have an authoritarian leadership style. Typically, when a leader makes a decision the rest of the organization follows orders. However, the leader of SPO had more of a consultative leadership style, especially when it came to making decisions on matters as personal as the culture of the organization. Because of this, the next step was to educate his staff on Lean and secure their commitment to supporting a Lean journey. A Lean kick-off meeting held in July 2007 helped to educate the leadership team. The team was assigned mandatory reading assignments before the meeting.

These articles and papers helped level everyone on what Lean was and helped them form their own opinions for the meeting. Forming opinions and expectations created opportunities for surprise and learning. In the five-hour face-to-face meeting, the leadership team reviewed and discussed several Lean topics including:

- Why was Lean needed in SPO and why now?
- What is Lean?
- History of Lean
- Steve Spear and Kent Bowen's Four Rules of the TPS
- Steve Spear's four lean organization capabilities
- Review of one Initech factory's Lean journey
- Applying Lean in non-factory settings
- Lean Enterprise analysis methodologies
- Hypothetical examples of what Lean in SPO would look like
- Roadmap and timing for a Lean journey

By the end of the meeting, 50% of the leadership team was fully committed, 25% were committed but needed more information, and the remaining 25% were unsure. The leadership team decided to move forward with a Lean journey, hold offline discussions with managers to address any concerns, and use future staff meetings to begin educating the leadership team on Lean. Supply Planning Operations' Lean journey had begun.

6. WHAT is Leading Lean?

Educating the leadership team on Lean concepts, principles, and behaviors was the next step in the transformation strategy. It was critical that the leadership team lead this effort and not delegate it to an external group, outside consultants, or subordinates. Leaders own driving the cultural shift. Delegation of the Lean journey signals a lack of personal commitment and conviction to employees. Leaders need to embrace Lean and make it personal to ensure a successful transformation.

The strategy for educating the leadership team of SPO primarily focused on high-level overview sessions in a group setting with time for discussion. Individuals who wanted to dive deeper on their own were provided with optional reading assignments. The overview classes summarized below in chronological order from the Lean journey kick-off meeting became progressively deeper as the SPO's leadership team became more familiar with Lean thinking:

- **[Week 0] Lean Journey Kick-off Meeting** – High-level overview of Lean to secure commitment from leadership team

- **[Week 4] Lean 1/2-Day Training and 1/2-Day Discussion** – Reviewed the rules and principles of Lean used by Initech's factory network

- **[Week 4] 1/2-Day Discussion on Lean Transformation Challenges** – Discussed the definition of "value" for a supply chain organization and aligned the staff on how Lean compared to prior operational excellence efforts

- **[Week 9] Lean Training 1-Week** – Reviewed Lean rules, principles, and culture in depth - the training session was developed by the Lean Learning Center and delivered by Initech Lean practitioners in the factory network

- **[Week 10] Discussion on Lean Vision and Challenges** – Discussed the future vision of Lean with SPO and developed countermeasures for problems related to creating a Lean culture

- **[Week 20] Lean Techniques for Strategic Planning** – Utilized Lean enterprise analysis techniques and processes for SPO strategic planning purposes

In addition to these classes and group discussions, a recommended reading list provided a path for Lean education to leadership team members with an autodidactic personality dynamic. The reading recommendations included articles by Steve Spear, Jamie Flinchbaugh, and Charles Fishman. The top three recommended books on Lean were *The Elegant Solution* by Matthew May, *The Hitchhiker's Guide to Lean* by Jamie Flinchbaugh and Andy Carlino, and *The Toyota Way* by Jeffry Liker. **Appendix B: Sample of Self-Paced Lean Training** is a portion of this self-paced training package that lists these references along with a short summary and purpose explaining why the source is recommended.

One critical tenant of Lean is the concept of *kaizen*, which means to "make a change for the better." This concept includes everyone, everywhere, everyday. This thesis proposes that if one's approach to Lean is "culture first," then the leaders who own driving cultural change should *hansei* (deeply reflect on) and *kaizen* their own leadership behaviors and practices to ensure a successful Lean transformation.

In parallel with the formal SPO leadership team classes on Lean thinking, individual leaders received advice and coaching on how to lead in a Lean way. This advice was non-prescriptive and served as a tool for reflecting on individual leadership norms. As part of the Lean journey, which is still in its infancy, the leadership team is reflecting on and comparing the group's leadership and management practices with those advocated by Lean experts including Steve Spear, Jim Womack, Jeffrey Liker, Matthew May, and Lean Learning Center consultants. Here, it is important to distinguish between actual leadership behaviors and values SPO's leaders preach but not practice consistently. St. Francis of Assisi captures this sentiment well, "Preach always, and if necessary use words."

"Leading Lean" applies the concepts and theories of Lean to the management and leadership itself. "Leading Lean" is difficult, as it requires leadership practices and behaviors that challenge some of SPO's existing leadership norms. This thesis captures the team's current level of understanding for what leadership norms and behaviors need to develop further including:
- Adopting a Weakness Orientation and Learner Leadership Style

- Staying in Touch with the *Gemba*
- Management by Means
- Developing Others through Servant Leadership

6.1. Adopting a Weakness Orientation and Learner Leadership Style

Lean is a fragile system by design. One basic tenant of Lean is to expose and permanently fix problems. Lean welcomes problems as opportunities to learn. The faster an organization can find and fix problems, the faster it learns, grows new capability, and fundamentally strengthens its systems. One of the pillars of the Toyota Production System (TPS) is *jidoka*. With *jidoka*, work is designed with built-in self-tests to reveal problems immediately. Several Lean tools that help expose problems include *kanbans*, 5S or SCANDO, and *andon* systems.

Under Lean, everyone from the front-line worker to senior management is encouraged to bring problems to the surface immediately. Given the fact that no one is perfect, a leader should take a similar approach toward evaluating his or her own leadership norms and management styles. Compare the emotional response to the same personal reflection question phrased two ways:

1) "What can I improve?"
2) "What are my problems?"

While the first question has a positive, optimistic framing, it only implies that there is a problem, but it is not direct. The second question with a "weakness orientation" framework evokes a different emotional response. This "problems first" or "weakness orientation" sounds a bit pessimistic, but for a positive reason. This framing pulls out the most pertinent, useful facts directly and helps fix problems faster.

"Weakness orientation" is an especially important leadership characteristic for a successful Lean journey. SPO leaders have decided to share personal leadership and management weaknesses based on recent Leadership Feedback Tool (LFT) results. While this was a

difficult process at times, the problems discussed were opportunities to learn and improve cooperation and communication within the team. The open and honest "weakness oriented" approach toward solving problems will strengthen the team faster in the end.

In *The Hitchhikers' Guide to Lean*, the authors argue that Lean leaders should adopt a "learner" instead of a "knower" leadership style.[41] A "knower" style creates impressions of knowing everything and hides gaps in knowledge for fear of losing face and credibility. A leader with a "learner" style says openly and honestly that he or she does not always have all the answers and that he or she is learning just as everyone else is.

Dangers of a "Knower" Leadership Style

- Subordinates emulate the "all knowing" behavior as a best-known method for advancement
- Employees suppress real problems instead of asking for help and coaching –this slows down organizational learning
- When employees eventually see through the fact that the leader does not know everything, the leader loses respect and integrity

Advantages of a "Learner" Leadership Style

- Creates an open, honest work environment because even the boss does not have all the answers
- Makes subordinates more comfortable with saying they also don't have all the answers or they have problems, which accelerates organizational learning
- Helps promote a culture of learning and teaching others

Adopting a healthy, robust "weakness orientation" and a "learner" leadership style are important Lean leadership characteristics for SPO's leadership team to embrace. Not only does it reinforce the concept of *hansei* (personal introspection), but it also helps the team

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[41] Flinchbaugh, Jamie, Andy Carlino, and Dennis Pawley. *The Hitchhiker's Guide to Lean: Lessons from the Road.* Dearborn, MI: Society of Manufacturing Engineers, 2006, pg. 38.

remain humble and open to other problems. This helps form the basis of a learning culture. In *The Elegant Solution*, Matthew May describes this learning culture as one where:

- Humility is the basis for perpetual learning
- Critical thinking is handed down from mentor to disciple
- Leaders ask questions to enable team members to arrive at their own insight
- Pursuing the right questions is more important than securing the right answer
- Leaders make learning the job

SPO leadership also wanted to stress the importance of learning by doing for the leadership team. One key tenant of Lean is that learning is part of everyone's job. When compared with the Learning Cycle model shown in Figure 13, the leader of SPO felt that the leadership norms in SPO placed a lot of emphasis on teaching and creating change at the expense of overlooking the steps of learning and doing. Lean leaders need to complete the entire cycle. In addition to teaching and creating change, they also have to learn themselves and practice the new skills by doing. The following quote captures this idea well: "What I hear, I forget. What I see, I remember. What I do, I understand." - Chinese proverb.

Learn **Do**

Change **Teach**
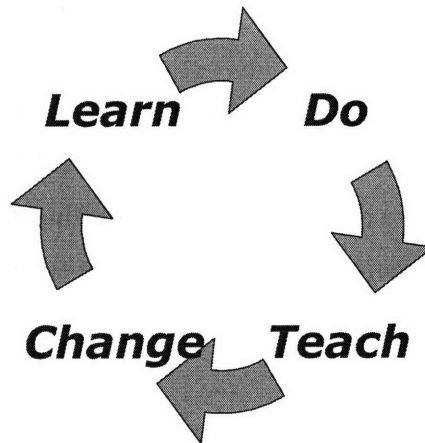
Figure 13: SPO's Model for the Learning Cycle

6.2. Staying In Touch with the Gemba

Leaders need more than a superficial understanding of work; they need to know how to cover work for direct reports and be able to understand the details of the *gemba* (where the value is created). Leaders must understand the work in detail so that they can become the best teacher possible for employees. Leaders should practice direct observation of the work and help identify problems and areas for improvement. At Toyota, leaders go to the *gemba* and improve work on a daily basis. However, if done improperly employees can misinterpret this management involvement as micromanagement. Some countermeasures for avoiding this perception include:

- Helping employees understand that staying "in touch" with the work helps leaders maintain technical competency and makes them better suppliers of coaching and mentoring to the customers, the employees
- Adopting a "learner" leadership style - the boss is a "learner" too and does not know everything
- Teaching workers how to solve problems for themselves independently and do not solve their problems for them - use techniques like the Socratic Method to teach instead of prescribing the solution

A closely related behavior for staying in touch with the *gemba* is *genchi genbutsu* or "going and seeing." This means that leaders should "go see" for themselves to thoroughly understand the situation and the context of a problem. This behavior helps leaders "stay in touch" with problems through direct observation of reality and ensures that leaders think and speak based on verified, proven information.

Taiichi Ohno turns this concept regarding the need for leaders to stay in touch with the *gemba* around. According to Ohno-san, the production plant or the *gemba* "provides the most direct, current, and stimulating information about management." In other words, the health of the *gemba* is actually a reflection of the leader's values and performance.

SPO's leadership team has started to change its behavior for staying in touch with the *gemba* through the *genchi genbutsu* practice of direct observation. Observing an office *gemba* looking for waste is different from a shop floor waste walk in a factory. The inventory is largely electronic and most of the activities and processes occur on a computer screen. This can make direct observation a challenge. In Q4 2007, the entire team completed a direct observation exercise. Each team member identified a small process and formed an initial hypothesis and set of expectations for what they would observe. This minimal pre-work helped create the opportunity for surprise and learning. The findings shared with the leadership team revealed lots of wasted human capital. It also gave the team a new appreciation of their responsibility for improving the quality of work. As a result, SPO management is getting more involved in the process of figuring out the answers versus taking a more passive role.

6.3. Management by Means (MBM) Versus Management by Results (MBR)

In *The Toyota Way*, Jeffrey Liker describes Toyota as an "enabling bureaucracy." (Adapted from P.S. Adler, "Building Better Bureaucracies," *Academy of Management Executive*, 13:4, 1999) Liker compares the social structure of an organization with its technical structure (see Figure 14). According to Liker, Toyota has a highly bureaucratic technical structure with a rigid framework of rules and procedures.[42] At the same time, is has an enabling social structure of empowered employees supported by leadership that is committed to organizational learning. As stated before, "staying in touch" with the *gemba* is one way Toyota leaders are able to maintain technical competency.

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[42] Liker, Jeffrey K. *The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer*, McGraw-Hill, 2004, pg. 145.

Social Structure

	Coercive	Enabling
High Bureaucracy	**Coercive Bureaucracy** ➤ Rigid rule enforcement ➤ Extensive written rules and procedures ➤ Hierarchy controls	**Enabling Bureaucracy** ➤ Empowered employees ➤ Rules and procedures as enabling tools ➤ Hierarchy supports organizational learning
Low Bureaucracy	**Autocratic** ➤ Tops down control ➤ Minimum written rules and procedures ➤ Hierarchy controls	**Organic** ➤ Empowered employees ➤ Minimum rules and procedures ➤ Little hierarchy

Technical Structure (vertical axis label)

Figure 14: The Enabling Bureaucracy of Toyota (adapted from *The Toyota Way*)[43]

Using this framework, SPO's leadership team found the organization tended to express an "enabling" social structure with little bureaucracy. This "organic" structure strove to empower employees and had very few rules and procedures. As a result, SPO's bureaucracy and systems are based on undocumented tribal knowledge. One potential explanation for so few procedures and processes is that SPO's leadership team historically tended to more heavily use Management by Results (MBR) over Management by Means (MBM). When leaders manage the means for how work gets done they place relationships and improving the team's capability ahead of a short-term gains. This helps create sustainable improvements that are not lost. Figure 15 contrasts these two styles in more detail:

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[43] Ibid., pg. 145.

Management by Means Leadership Style	**Management by Results Leadership Style**
• Investment in the people and processes will lead to the results desired	• Focus on the bottom-line results at the expense of how the results were achieved
• System optimization	• Local optimization
• Sees causal loops and system dynamics	• Sees causes linked to local effects
• Long term focus	• Short term focus
• Means not subordinate to ends – they are ends-in-the making	• The ends justify the means

Figure 15: MBM vs. MBR

H. Thomas Johnson and Andre Bröms take this line of thinking on step further in *Profit Beyond Measure*. "Management by results is appropriate to mechanical systems. The widespread misapplication of management by results practices to businesses – adaptive natural systems – is the source of most problems in the business world today. … it is essential that business leaders follow the manage-by-means, or MBM, practices appropriate to natural systems, such as large-scale companies."[44] MBM managers "view the organization in terms of patterns and relationships that connect people in the organization with each other, with customers, with the community, and with the ecosystem."[45]

Nelson Repenning and John Sterman developed a system dynamics model for describing the negative effects of managing by results. "If managers respond to a throughput gap by increasing work pressure, employees increase the amount of time spent working and cut the time spent on improvement. Capability begins to decay. As capability erodes, the performance gap grows still more, forcing a further shift towards working harder and away from improvement. Here the reinvestment loop (R1) operates as a vicious cycle, driving the

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[44] Johnson, H. Thomas and Andre Bröms. *Profit Beyond Measure: Extraordinary Results Through Attention to Work and People*, The Free Press, 2000, pgs. 43-44.

[45] Ibid. pg. 74.

organization to ever-higher degrees of work pressure and minimal levels of process capability. Not surprisingly, such a vicious cycle quickly drives out meaningful improvement activity."[46]
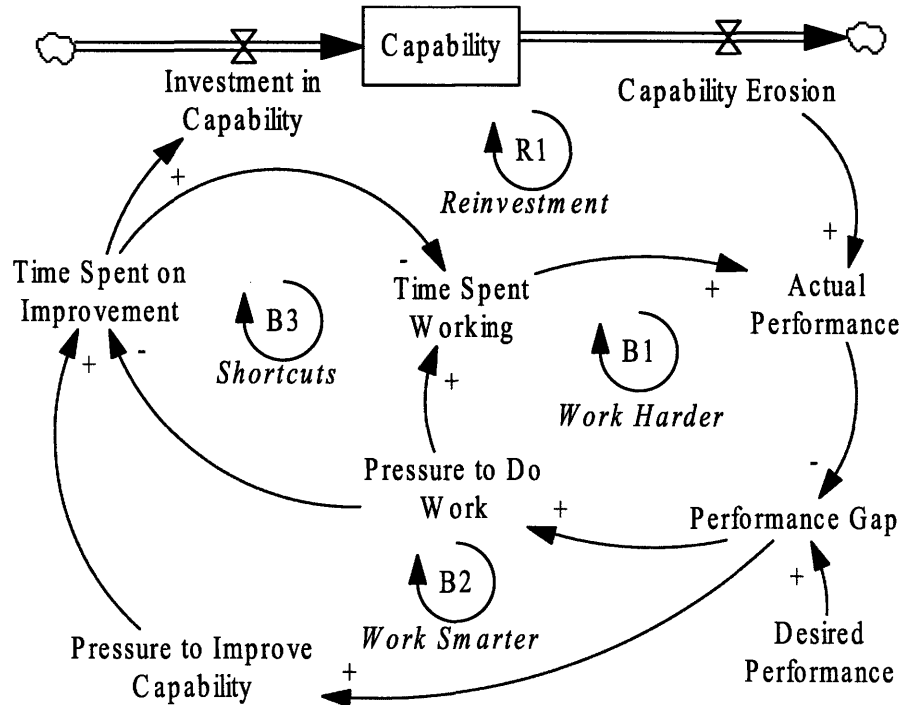
Figure 16: System Dynamics Model of the Capability Trap (adapted from Repenning and Sterman)[47]

Repenning and Sterman's simulation results from the system dynamics model show that MBR and pressure to work harder does indeed produce short-term performance improvements. However, as the organization's capability erodes, performance drops despite increased management pressure. The organization falls into the "capability trap." Unfortunately, the only way out of this "capability trap" is for leaders to either reduce the amount of *muri*, or overburden, on employees by terminating or putting projects on hold or by dedicating more resources. This is the only way that employees will find the time to begin to re-invest in the "working smarter" loop (B2).

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[46] Repenning, Nelson P. and John D. Sterman. "Nobody Ever Gets Credit for Fixing Problems that Never Happened," *California Management Review*: Vol43, No 4, 2001, pg. 71.

[47] Ibid., pg. 71.

Figure 17 shows a graphical representation of performance results from the "working harder" vs. "working smarter" models. These results indicate that performance for the "working smarter" approach degrades in the short term but is stronger in the long term when the organization's capability improves.
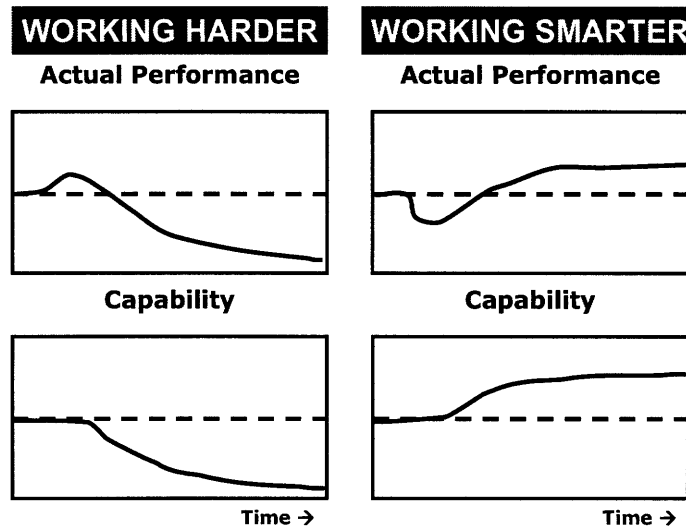
Figure 17: Capability Trap System Dynamics Simulation Results (adapted from Repenning and Sterman) [48]

Leaders need to be patient while waiting for results due to the delay between efforts spent on improvements and actual performance increases driven by increased organization capability. It is often the case when beginning a Lean journey that things may be "worse before better." For example, within SPO employees questioned the need to spend time documenting and developing standard work procedures. It is common for a team's performance to drop when leaders prioritize time for cleaning house, developing standard work, and documenting tribal knowledge. If done right, these efforts increase the team's performance in the end.

Process orientation and focusing on how work is done should be balanced with the driving results. Some groups within SPO have begun to develop a "planning standard work" framework for critical business processes. One group found that 28 of 48 key business processes had little to no documentation. The framework includes the following elements:

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[48] Ibid., pg. 74.

1) PROCESS OVERVIEW

2) PROCESS HIGH LEVEL FLOW

3) PROCESS DETAIL

4) PROCEDURES

5) GLOSSARY FOR DOCUMENT FIELDS

6) DOCUMENT STAKEHOLDERS

7) PROCESS APPROVERS

8) DOCUMENT REVISION HISTORY

SPO's framework contains many of the elements Bowen and Purrington found while studying Pratt and Whitney's Engineering Standard Work practices. The six elements of Pratt and Whitney's framework include:[49]

1) Workflow maps

2) Tools and methods

3) Design criteria

4) Design standards

5) Lessons learned

6) Practitioner proficiency assessment

A standard work framework captures how and when work is done and by whom. Standard tools, methods, and design criteria support *jidoka* and identifying problems when and where they occur. Standard work describes how to determine if the work was correctly completed and is defect-free. The lessons learned stress the need for continuous improvement under the guidance of an expert. While more difficult than just focusing on the end result, this management by means approach is the foundation for sustainable continuous improvement.

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[49] Bowen, H. Kent and Courtney Purrington. "Pratt & Whitney: Engineering Standard Work," Harvard Business School Publishing, Case Study 9-604-084, rev. April 7, 2005, pg. 9.

6.4. Developing Others through Servant Leadership

In order to build a learning organization, Lean leaders must teach. Leaders need to be able to transfer skills and ideas to others. In fact, Toyota managers have a "servant leadership" mindset where the managers and leaders of an organization are the "suppliers" and the employees are the "customers" of their training and mentoring services. This essentially creates an inverted work pyramid with front-line workers on the top and leaders on the bottom (see Figure 18).
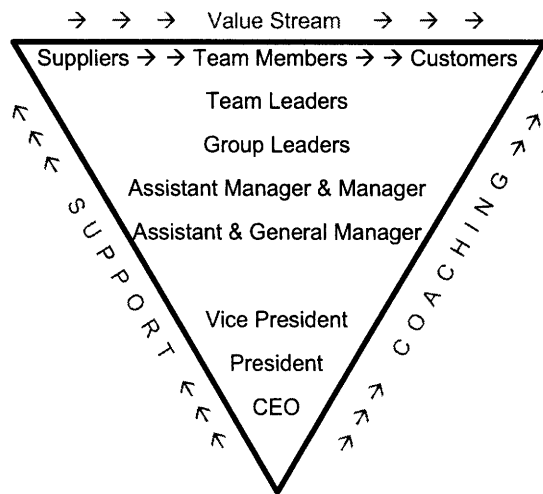
Figure 18: Servant Leadership in Toyota Plants (adapted from *Toyota Culture*)[50]

Teaching content drives a deeper level of understanding than passively absorbing information from a presentation. It is critical for Lean leaders to not abdicate or outsource the responsibility for teaching, coaching, and mentoring employees to a 3rd party, like a Lean consultant or Lean department. Teaching is a critical element of Leading Lean. According to Spear, "Managers should coach, not fix."[51] Within SPO, the leadership team is taking on the direct responsibility for teaching Lean to their respective teams. In addition to teaching a one-day Lean Office class, some of SPO's leaders plan to become trainers for the weeklong Lean Experience class developed by Lean Learning Center.

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[50] Liker, Jeffrey K. and Michael Hoseus. *Toyota Culture: The Heart and Soul of the Toyota Way*, McGraw-Hill, 2008, pg. 321.

[51] Spear, Steven, "Learning to lead at Toyota," *Harvard Business Review*. May;82(5), 2004, pg. 85.

Because Lean presents a fundamentally new set of principles, values, and way of thinking for some people, teaching the concepts to others can be a challenge. When trying to teach new concepts and persuade others to change, it is often helpful to understand their learning and information integration processes. One framework utilized previously by the factory network to describe and understand learning processes is Human Dynamics.

Begun by Sandra Seagal and David Horne, Human Dynamics is a body of work that "identifies and documents inherent distinctions in the functioning of people as whole systems. These distinctions in human functioning are more fundamental than age, race, culture, or gender. … Nine distinct human systems have been identified; five of which greatly predominate in Western cultures."[52] These human systems draw distinctions in the way people think, learn, communicate, interact, create, develop, and contribute to their groups and relationships. The nine systems are composed of three basic ways for organizing and processing information – mental, emotional, and physical. These three universal principles and associated pronouns are shown in Figure 19.

Mental
It
The

Thinking
Objectivity
Vision
Overview
Structure
Values

Emotional
It
Me
Mine

Feeling
Subjectivity
Relationship
Communication
Organization
Creative Imagination

Physical
We
Us
Our

Doing
Making
Actualizing
Sensory Experience
Systemic Experience
Practicality
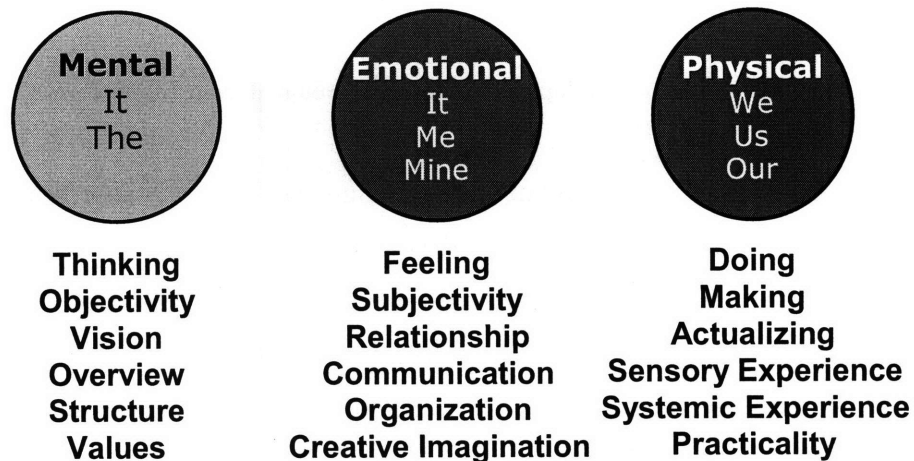
Figure 19: Three Universal Principles of Human Dynamic Systems[53]

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[52] Seagal, Sandra and David Horne. Human Dynamics: A New Framework for Understanding People and Realizing the Potential in Our Organizations. Waltham, MA: Pegasus Communications, 1997, pg. xix.

[53] Ibid. pg. 27.

The approach to how people think and learn is inherently developmental. Instead of sticking people in boxes and pigeonholing them, Human Dynamics highlights peoples' distinctive patterns for change and growth. "Human Dynamics is not a typology. Human Dynamics identifies fundamental structures (the hard-wiring) that underlie distinctions in the functioning of people as whole systems and describes the processes and functions of these systems."[54] It focuses on the systemic function of people both as individuals and within a group. Understanding the different ways people learn and process new information is critical for enhancing the learning of new concepts like Lean. Five human systems or personality dynamics dominate the Western world. People with each of these five dynamics have their own unique capabilities:

- **Mental-Physical** - determine and maintain long-range vision for self, others, and groups by perceiving and articulating guiding values and principles
- **Emotional-Mental** - sense emergent directions and new possibilities and then initiate change and forward movement by challenging inertia and breaking through old forms
- **Emotional-Physical** - intuitively understand the nature of people and use this ability to create and facilitate harmonious relationships by personally connecting with and organizing people with diverse talents
- **Physical-Emotional** - think and implement things systematically by experiencing everything as a part-within-a-whole
- **Physical-Mental** - perceive patterns in the complex interplay of events and systematically create and implement strategic, systemic models

Comprehending one's own personality dynamic in relation to others provides crucial insight for how to best approach educating and persuading others. Each dynamic processes and integrates information in different ways. Each also has unique needs that one should take into account when communicating information to them (see Table 4). Understanding another's personality dynamic can be a powerful tool for constructing effective training and educational presentations on Lean concepts and principles.

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[54] Ibid.

Personality Dynamics   **Communication Needs**

Personality Dynamics	Communication Needs
Mental-Physical	Clear--Objective Logical--Precise
Emotional-Mental	Direct--Goal-oriented General picture Responsive/interplay of ideas
Emotional-Physical	Personally connecting Sensitive to feelings Real feelings expressed Process oriented
Physical-Emotional	Sufficient context to see whole picture Concrete, factual details Time for reflection before response
Physical-Mental	Purpose clearly established Logically linked framework Sufficient relevant detail

Table 4: Personality Dynamic Communication Needs[55]

Each of the five dynamics also has its own pace and rhythm for communicating. Understanding these different rhythms in relation to one's own is important. If the leader has a different dynamic, he or she should be open to adapting his or her own natural communication rhythm to fit that of the audience. While this may not "feel" right, it is often a more effective pace and style for the audience, who is customer in this context (see Figure 20).

Mental-Physical
Logical progression of independently expressed essential points

Emotional-Mental
Interactive process in which ideas are shaped and reshaped

Emotional-Physical
Interpersonal process involving the people, their subjective experiences, information and the task

Physical-Emotional
Accumulation of past/present experiences and data, individually expressed in whole "stories" to create systemic understanding or systems

Physical-Mental
Outcome oriented information systematically gathered and tested to arrive at sufficiently detailed understanding to meet given purpose

Figure 20: Personality Dynamics Communication Rhythms (adapted from *Human Dynamics*)[56]

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[55] Ibid. pg. 217.

This Human Dynamics framework is a powerful tool for improving the communication of ideas and concepts to leaders at the beginning of a Lean journey. A Lean advocate or change agent can use this framework proactively to anticipate another's natural challenge to a Lean transformation. For example, if someone has an Emotional-Mental dynamic, one should be aware of the other programs or new initiatives the person is driving. If Lean does not align well with his or her programs, then one should expect problems. Correspondingly, an educator with a systems-oriented Physical-Emotional dynamic should not expect someone with an Emotional-Mental dynamic to intuitively comprehend Lean as a tightly integrated system of complimentary principles, values, and techniques as he or she does.

The leader's own personality dynamic and hard-wired behaviors form the basis for countermeasures to these problems. Understanding another's dynamic can help one optimize communication styles for his or her dynamic. For instance, one countermeasure for persuading someone with an Emotional-Physical dynamic is to hold small group meetings to discuss everyone's concerns and thoughts toward a Lean transformation for an organization.

Once a person is onboard with supporting a Lean transformation, he or she can observe and asses another's level of commitment through the natural tendencies of the other's personality dynamic. If the person has a Mental-Physical dynamic, one sign that he or she is embracing Lean is when he or she starts to practice and live the new values and principles in everyday actions. This is a particularly significant behavior for a personality dynamic driven by and based on values.

Finally, one can use this human dynamics framework to look out for leadership behaviors that may put the Lean journey at risk. Helping others understand their natural behaviors that go against Lean thinking is critical for ensuring a successful Lean journey. For example, someone with an Emotional-Mental dynamic may tend to move forward too fast and focus to closely on

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[56] Ibid. pg. 213.

quick wins. The person may want to move forward so fast that he or she often overlooks problems with implementing Lean and creating a Lean culture within the organization.

Table 5 provides a detailed summary for each personality dynamic on 1) the potential obstacles to Lean thinking, 2) countermeasures, 3) signs of embracing Lean, and 4) potential risks moving forward on a Lean journey. Leaders, change agents, and Lean advocates can use this framework for anticipating and overcoming problems associated with getting everyone within an organization on board with beginning a Lean journey. As a summary, Table 5 is intentionally not a comprehensive analysis for each dynamic. Refer to *Human Dynamics* by Sandra Seagal and David Horne for a more extensive and in-depth analysis.

The leadership team for SPO is primarily Emotional-Mental. The author's view is that this means the team should be careful and mindful of moving too fast on the Lean journey and take extra time to understand the challenges with implementing a Lean culture. Moving too fast and focusing on tools and results could lead employees to believe Lean is the program of the year. Allowing time for reflection on the Lean journey is important for the Emotional-Mental communication rhythm where ideas are shaped and reshaped through an interactive process.

Lean Transformation Challenges Based on Human Dynamics

ıman namic	Potential Problem with Lean	Countermeasures	Signs of Success	Potential Ri Moving Forw
ental- ysical	Lean may not align with their existing core values or Lean values/principles were not clearly communicated	• Appeal to their values • Clearly, carefully define Lean words and terminology for them • Describe the very long-term advantages of Lean (3-10 years) • Clear, logical, structured presentation with an overview upfront • Create learning opportunities through solitary work	Starts to practice and "live" the new Lean values and principles in action	Internally zealc Lack of humili Not vocal enou
ɔtional- ental	Lean may not align with their latest initiative or program	• Give them a general picture of Lean and what it will do for the organization then allow time for brainstorming and discussion • Show how Lean can make a difference tomorrow in empowering others, generating new ideas, and respecting people as equals • Use simple models and face-to-face interaction and dialogue	Starts to publicly advocate and personally commits to a Lean way of thinking	Program of the Does not sustain th Moves forward too see problems v implementatic
ɔtional- ysical	Lean may create tension, conflict, and emotional churn	• Focus on changing and creating a positive intuition towards Lean with personal examples and testimonials • Describe how Lean encourages diverse opinions and enables others and creates a great place to work • Meet in small groups to discuss everyone's thoughts and concerns • Imaginative, dynamic presentations appealing to emotions	Starts to help others struggling with Lean	Does not see and cı integrated syste
ysical- otional	Lean is introduced by an outsider unfamiliar with the challenges/context of the existing system Lean comes across as a lot of high level marketing without data and results	• Present the roots, historical context, and continuity of Lean • Show how Lean is a holistic system that creates a "community" of scientists • Give them lots of information about Lean in the form of articles, books, and presentations and give them time to digest the information • Use "hands-on" techniques with clear parameters for assignments • Make sure they understand that the decision makers have done their homework and will not change their mind about Lean thinking • Teach by telling stories with lots of context, adopt a dynamic teaching pace, and be prepared to move quickly through the material	Starts to use Lean tools and behaviors tactically and asks for more information on Lean	Frustrated by the l progress by oth Insufficient pers reflection Negative reactions experiments
ysical- ental	Does not understand or disagrees with the purpose of Lean Unsure of the ramifications of a Lean transformation	• Present a board overview of the past/present/future of Lean • Show a clear purpose and expected actions for going forward • Use diagrams, models, maps to summarize and organize information • Provide handouts to take notes on and capture key thoughts • Use "hands-on" techniques with clear parameters for assignments • Show the long-term goals and a step-by-step implementation plan	Start to build Lean tools and principles into their own strategies	Compelled to fix ratl coach and tea Well-intentioned e could results in beat

Table 5: Lean Transformation Challenges Based on Human Dynamics Framework

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In conclusion, SPO's leadership team has found that leading in a Lean fashion challenges several existing management norms. Adopting a weakness orientation, a "learner" leadership style, staying in touch with the *gemba,* management by means, and developing others by embracing a servant leadership mindset will be difficult for many of SPO's managers. Despite this difficulty, the Lean transformation must start at the top of the organization to ensure a successful cultural transformation. Having analyzed the key gaps between SPO's current leadership norms and those described by Lean experts, the next section will focus on how leaders drive change and embed a new culture within an organization.

7. How Do Leaders Drive Change and Embed Culture?

"What is the primary role of a Lean leader?" The authors of *The Hitchhikers' Guide to Lean* argue that it is not just setting the vision, establishing priority, or providing motivation. Rather, it is to create change.[57] "Managing" maintains the status quo or the current reality while "leading" changes things, moves things forward, and produces different results than those achieved previously. According to John Kotter, "Leadership defines what the future should look like, aligns people with that vision, and inspires them to make it happen despite the obstacles."[58] Creating change and moving the organization forward is a leader's only "value added" activity from a customer's perspective. This is not without risk. Machiavelli expressed this risk and the associated problems with change when he said, "And it ought to be remembered that there is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success, than to take the lead in the introduction of a new order of things. Because the innovator has for enemies all those who have done well under the old conditions, and lukewarm defenders in those who may do well under the new."

When first introduced, an organization's initial response to Lean thinking can take many different forms. Developing a framework for understanding why people respond to Lean thinking in the way that they do is an important step for Lean leaders and change agents. Lean leaders can then use this understanding to anticipate problems and proactively develop countermeasures for the Lean transformation.

The framework in Figure 21 attempts to predict an organization's response to Lean based on the relative openness to change and prior experience with managing increasing levels of complexity. For example, if an organization is not very open to new ways of thinking and has extensive experience with managing complex systems, then the organization is likely to respond to Lean thinking as something that they already do – only they do not call it "Lean."

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[57] Flinchbaugh, Jamie, Andy Carlino, and Dennis Pawley. *The Hitchhiker's Guide to Lean: Lessons from the Road.* Dearborn, MI: Society of Manufacturing Engineers, 2006, pg. ix.

[58] Kotter, John P. *Leading Change*, Harvard Business School Press; first edition, 1996, pg. 25.

Any organization that successfully manages complex system problems likely has some elements of Lean, such as structured activities and clear connections. However, other elements of Lean are likely undeveloped or missing. This mentality of "we already do Lean" can result in blind spots.

Initial Response To Lean Thinking

	New To Managing Increasing Complexity	Experienced with Managing Complexity
Organization Open To Change & New Ideas	Lean Is Revolutionary *Risk: Over Reaching*	Lean Is Evolutionary *Risk: Lack of Urgency*
Organization Not Open To Change & New Ideas	Lean Will Pass or Not Invented-Here *Risk: Time Bomb*	We Already Do Lean *Risk: Blind Spots*

Figure 21: Initial Response to Lean Thinking

The study of change management and developing change management models is not a new endeavor. Sociologists and organizational development researchers have created several frameworks over the years for describing change management. Some useful frameworks for analyzing SPO's Lean cultural change include Kotter's Eight Stages of Change and Gleicher's Formula; also known as the "Change Equation." These models are generic change management models concerning the type of change driven. One framework that focuses specifically on how leaders transmit and change the culture of their organizations is Edgar Schein's culture-embedding mechanisms.

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7.1. Kotter's Eight Stages of Change

John Kotter's Eight Stages of Change[59] describes the steps necessary to create a sustainable change within an organization. The Bolton Council linked common change management tools to Kotter's framework.[60] For example, if an organization is trying to create a sense of urgency, some of the tools that could support this effort include conducting a PEST analysis (Political, Economic, Social, and Technological analysis), identifying a burning platform, or sharing evidence on the need for change.

Stage 1: Establishing a Sense of Urgency - To establish a sense of urgency, look at the internal and external drivers of the change and decide what will happen if change does not occur.

- PEST analysis - An analytical tool looking at the external drivers for change
- Burning platform - A technique to highlight the sense of urgency for change
- Evidence – Use evidence to prove that change is necessary

Stage 2: Creating the Guiding Coalition: To create a guiding coalition gauge the current level of commitment for the initiative against the minimum level of commitment needed to succeed.

- Stakeholder Analysis - A tool for working out who should form the guiding coalition
- Commitment Diagram - A tool for looking at influencing the guiding coalition

Stage 3: Developing a Vision and Strategy: To develop a vision and strategy think about what the desired future state for the organization is and where leaders want to go, what the current state is, and how it prevents the company from fully achieving business objectives.

- Visioning - Develop a vision for the change

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[59] Kotter, John P. "Leading Change: Why Transformation Efforts Fail." *Harvard Business Review*, March-April, 1995. pp. 59-67.

[60] Bolton Council. "Change tools," from http://www.bolton.gov.uk/pls/portal92/docs/PAGE/CHIEF_EXECUTIVES_DEPARTMENT/ASSISTANT%20CHIEF%20EXECUTIVE/CORPORATE%20ORGANISATIONAL%20DEVELOPMENT/TRAINING_INTRANET_PAGES/CHANGETOOLKIT/CHANGE_TOOLS.HTM, March 2008.

- Restructuring - Change the way teams behave by restructuring roles and responsibilities
- Stepwise Change - Break change into pieces that are easy
- Whole-System Planning - A way to involve diverse and powerful sub-groups

Stage 4: Communicating the Change Vision: To communicate the vision, know who the audience is and what information they need to know. Find out about their concerns and address them to avoid resistance and look at how to build commitment and not compliance.
- The Newspaper Method - Get the key messages across, cut the rest
- Transportation Model - Transport key knowledge to a person

Stage 5: Empowering a Broad-Based Action: To empower action, leaders need to ensure that the organization has the skills to deliver change and demonstrate a commitment to change.
- Building Organizational Commitment - Get the team on board with the change
- Achievable Challenge - Get the team to achieve against change objectives
- First Steps - Micro-manage change in the team to enable large-scale change
- Involvement - Involve the staff in the change to gain buy-in
- Dealing with Resistance - Manage resistance to change
- Dealing with Unexpected Resistance - Tactics for dealing with surprises

Stage 6: Generating Short-Term Wins: Identify visible improvements in performance in the short term.
- Evidence Streams - Show change is real by providing a steady stream of evidence

Stage 7: Consolidating Gains and Producing More Change: To consolidate gains assess the progress, re-evaluate plans, and produce even more change, then look at how the organization has learned from prior actions
- Shift-and-Sync - Allow people to recover from recent change then implement more
- Institutionalization - Make change a part of the organization

Stage 8: Anchoring the New Processes into the Culture: To spread the new culture, ensure that the structure, processes, systems, and people reflect the cultural framework.

- Rites of Passage – Ritual to be used with a team when a difficult change is finished
- Burning Bridges - Make sure your team does not slip back into the old way of working by destroying the path back to the old ways of doing things

Related to Kotter's Eight Stages of Change are Eight Errors for describing why transformation efforts fail. Leaders can use these eight errors as a checklist to ensure a change will be sustainable:[61]

1. **Allowing too much complacency**
2. **Failing to create a sufficiently powerful guiding coalition**
3. **Underestimating the power of vision**
4. **Under-communicating the vision by a factor of 10 (or 100 or even 1,000)**
5. **Permitting obstacles to block the new vision**
6. **Failing to create short-term wins**
7. **Declaring victory too soon**
8. **Neglecting to anchor changes firmly in the corporate culture**

Using Kotter's framework to assess the sustainability of the Lean transformation in SPO results in the following insight:

Stage 1) The *Sense of Urgency* within SPO is bi-modal. On one hand, the leadership team sees an emerging crisis: business complexity is increasing in a flat to down headcount environment. The group is also lacking of robust tools and efficient processes. For many SPO employees there is no burning platform like a factory closing and there is not as much urgency for change. However, many employees do feel that and there is not enough time for personal development. While a Lean transformation will help with the impact of increasing complexity combined with ongoing attrition, employees do not believe that their jobs are at risk if the Lean transformation fails. There is also no compelling need to leave a legacy like when the Remus site was shutting down.

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[61] Kotter, John P. *Leading Change*, Harvard Business School Press; 1 edition, 1996, pg. 16.

Stage 2) The first few months of SPO's Lean journey was dedicated to *Creating the Guiding Coalition*. The leadership team spent several face-to-face staff meetings learning about Lean and getting each individual on board with the transformation. The team now has a powerful guiding coalition for the effort. SPO's leadership team is committed to a Lean transformation and important stakeholders, like the factory network and upper management, are supportive.

Stage 3 and 4) Lean thinking is new for SPO's leadership team. As a result, the team is still churning on *Developing a Vision* for the future state. Solidifying and clearly *Communicating the Vision and Strategy* to all employees is an important near-term step for the transformation. SPO staff decided to use some Lean Enterprise Analysis tools developed by MIT's Lean Advancement Initiative (LAI)[62]. The team used the LAI X-Matrix methodology as a strategic planning exercise for evaluating how closely integrated the group's metrics, processes, strategic objectives, and stakeholder values were. **Appendix D: SPO's Lean Enterprise Analysis X-Matrix – Q4 2007** contains the results from the initial X-Matrix. This process helped the team understand their value proposition and develop and strategy for changing the areas out of alignment or not tightly integrated. The leadership team is also communicating their vision for change via a one-day class focused on how Lean will be applied to SPO's globally dispersed office-based environment.

Stage 5) SPO's leadership team is *Empowering a Broad-based Action* by supporting each individual groups' plans to create Lean Learning Labs and experiment on different parts of Lean. Depending on the needs of the group, each of the leaders picked an area or facet of Lean to focus the effort. Some of these areas include direct observation, process standardization, A3s, and knowledge harvesting.

Removing obstacles highlighted by these broad-based actions will be a challenge for SPO's leaders. As a business process driven organization, most of the work is linked through complex, homegrown IT systems. Looking forward, removing many small IT system

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[62] Nightingale, Deborah J. and A. Stanke. "Enterprise Value Stream Mapping and Analysis (EVSMA)," Lean Advancement Initiative, 2004.

obstacles identified through a broad-based employee driven improvement effort will be difficult to resource when there are already major programs in the pipeline that are fighting for support and funding.

Stage 6) SPO leaders will not have a problem with *Generating Short-term Wins* with the current level of waste in the existing business processes. For example, one group within SPO dramatically reduced aged inventory positions by simply sharing best practices for managing inventory. Many of these little wins will produce dramatic results over time. One potential risk here is that SPO management may ask for a return-on-investment (ROI) analysis or overly complex tracking system for every small project and experiment. This could be perceived as pointless bureaucracy by employees and impede the Lean transformation effort over time.

Stage 7 and 8) *Consolidating Gains* and *Anchoring the New Processes into the Culture* has just begun. It is premature to declare any kind of a victory for a successful Lean transformation in SPO. Leaders need to be cautious about moving on to other efforts and diluting the organizational focus on Lean. The need to institutionalize the Lean cultural shift and standardize the practices and behaviors is critical before moving on to other top-down driven efforts.

7.2. Gleicher's Formula

Another change management framework for analyzing SPO's Lean transformation is Gleicher's Formula, also known as the Change Formula or Change equation. Richard Beckhard and Reuben Harris credit David Gleicher for creating this framework.[63] Gleicher's Formula is a simple, insightful concept that gives leaders a quick, first impression on the probability and conditions for creating a sustainable change. It is a qualitative equation of indicator variables where the multiplicative effect for driving change needs to overcome the resistance to change.

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[63] Beckhard, Richard, and Reuben T. Harris. *Organizational Transitions: Managing Complex Change (Addison-Wesley Series on Organization Development)* Addison Wesley Publishing Company; 2nd edition, 1987.

$$SD * V * FS > R = C$$

Figure 22: Gleicher's Formula

Gleicher's Formula says that in order for a change to last, the Shared Dissatisfaction (SD) with the status quo; times the Vision (V), goals, outcomes, or desired future; times the First Steps (FS) needs to be greater than (>) Resistance (R). If it is, then that equals successful change (C). Because the left side of the equation contains only multipliers, if any factor (SD, V, or FS) is missing then the entire left-hand side is negligible; and resistance prevents any meaningful change. Many organizations are great at one or two of the factors and miss the third. Leaders need to drive all three vectors to overcome the inertia of the status quo. Visualizing these vectors in three dimensions, as shown in Figure 23, helps one conceptualize the rationale for driving all three efforts in parallel.

Graphical Version of Gleicher's Formula

Dissatisfaction

First Steps

Resistance

Vision
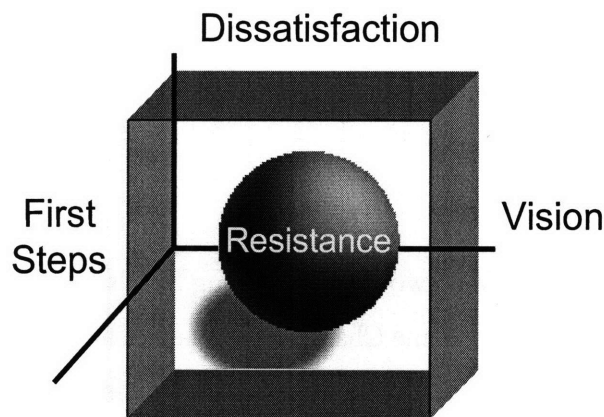
Figure 23: 3D Conceptualization of Gleicher's Formula

Since 1987 when Beckhard and Harris first popularized the idea, researchers and consultants have expanded on and modified the formula. For example, Lean Learning Center (LLC) consultants modified Gleicher's Formula to help describe the elements needed for a Lean change. In the LLC version shown in Figure 24, hatred of the current reality (H); times vision of the ideal state (V); times the courage to take the first step (F) needs to overcome (>) the

resistance to change within an organization. LLC consultants substituted hatred for dissatisfaction to stress the point that people really have to hate their current state in order to be willing to take risks and change.

$$H * V * F > R$$

Figure 24: Lean Learning Center Version of Gleicher's Formula

Initech Lean transformation champions use this LLC version of Gleicher's Formula for educating others on the importance of having all three elements. Figure 25 expands the formula in matrix format by highlighting the impact of falling short on one of the three elements. Without a clear vision, the change effort plods along without the complete commitment of the organization. Without a first actionable step, pressure for change raises the level of anxiety and employee uncertainty results in non-optimal efforts. Without urgency, there is no pressure for change, and employees place a low priority on the effort and attempt to wait for it pass.

Vision x 1ˢᵗ Actionable Step x Urgency > Resistance To Change

Clear Vision	+	Actionable Steps	+	Pressure for Change	=	Plodding & Lack of Commitment
Clear Vision	+	Actionable Steps	+	Pressure for Change	=	Anxiety, Running In Place, Lackluster Effort
Clear Vision	+	Actionable Steps	+	Pressure for Change	=	Bottom of In-box, Wait Out the Current Program
Clear Vision	+	Actionable Steps	+	Pressure for Change	=	Real, Lasting Progress

Figure 25: Modified Gleicher's Formula in a Matrix Format

Using this framework as a tool for reflecting on change management norms within SPO, interviews with several employees revealed that "setting a clear vision" was a historically weak

area for the organization. Using this model to foresee future problems, the leadership team needs to clearly communicate a vision for the future soon or risk causing the Lean transformation effort to plod along without the full commitment of the entire organization. Building consensus amongst the leadership team and developing a Lean vision for the future and team will take some time and effort. The leadership team needs to think deeply about their future Lean state, construct a vision, and clearly communicate it to all employees, recognizing that it is not perfect and will likely change as the group learns. Some members of the leadership team recently toured Virginia Mason Medical Center (VMMC) and created their own version of VMMC's Lean strategy (see Figure 26).

Figure 26: SPO's Lean Strategy Pyramid (adapted from VMMC)

Figure 27 depicts a proposal for SPO's Lean vision. Based on Toyota's concept of an ideal state that will never be reached, the diagram shows the need to balance customer satisfaction with employee satisfaction while everyone, everywhere, and everyday is working toward a

common goal. The leadership team needs to think deeply about their future Lean state, construct a vision, and clearly communicate it to all employees, even if it is not perfect.
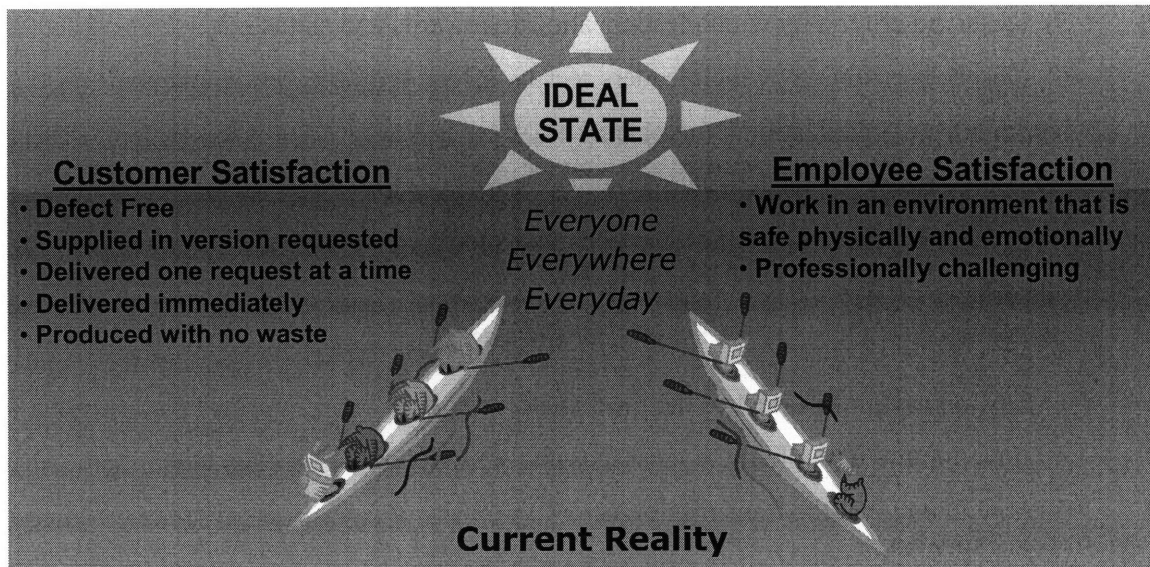
Figure 27: Proposal for SPO Lean Vision

7.2.1. How Leaders Embed and Transmit Culture

Having explored the applicability of Kotter's and Gleicher's general change management models, another framework by Edgar Schein yields additional insight for SPO's Lean transformation because it focuses specifically on how the founders and leaders embed and transmit cultural beliefs. Through daily interactions with employees, leaders frequently send unintentional messages through choices and actions. Leaders do not have a choice whether to communicate these messages or not; rather they can only choose how to manage what they communicate. Schein describes six primary embedding mechanisms used by leaders to transmit culture:[64]

    1) Deliberate role modeling, teaching, and coaching.

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[64] Schein, Edgar H. *Organizational Culture and Leadership*, second edition, Jossey-Bass Publishers: San Francisco, 2004, pg. 231.

2) How leaders react to critical incidents and organizational crisis.

3) What leaders pay attention to, measure, and control on a regular basis.

4) Observed criteria by which leaders allocate scarce resources.

5) Observed criteria by which leaders allocate rewards and status.

6) Observed criteria by which leaders recruit, select, promote, retire, and ex-communicate organizational members.

The effectiveness of these transmission mechanisms to drive cultural change is a product of three vectors:

1) how powerful the effect of the mechanism is,

2) how implicit or explicit the messages conveyed to employees are, and

3) how intentional the transmission is.

For example, a strong message that employees can directly link to a value or behavior due to a leader's intentional and explicit approach will likely move the cultural change further than if the message is less powerful, less obvious, or less tightly linked. Figure 28 assesses the relative effectiveness of Schein's six mechanisms along these three vectors based on the existing cultural norms within SPO.

How Leaders Embed and Transmit Culture				
#	Primary Embedding Mechanism	How Powerful Are the Effects	How Implicit or Explicit Are the Messages	How Intentional Is the Mechanisim
1	Deliberate role modeling, teaching, and coaching	High	Both	Intentional
2	How leaders react to critical incidents and organizational crisis	High	Implicit	Not Intenrional
3	What leaders pay attention to, measure, and control on a regular basis	High	Explicit	Intentional
4	Observed criteria by which leaders allocate scare resources	Medium	Explicit	Intentional
5	Observed criteria by which leaders allocate rewards and status	Medium	Explicit	Intentional
6	Observed criteria by which leaders recruit, select, promote, retire, and ex-communicate organizational members	Medium	Both	Not Intenrional

Figure 28: Culture-Embedding Mechanism Effectiveness within SPO

This examination of SPO's existing leadership norms reveals three embedding mechanisms that may be the most effective for changing the culture: 1) role modeling and teaching, 2) leaders response to a crisis, and 3) what leaders pay attention to and measure regularly. All three of these mechanisms could have a powerful impact if applied properly.

Explicitly role modeling Lean values and principles within the organization is critical. It is not sufficient to proclaim the importance of Lean, but rather leaders need to be actively engaged in Lean transformation activities and lead by example. Visible leadership participation adds credibility and relevance to the Lean efforts. In order to role model, Leaders need to have a very deep understanding of the rules and principles. One way to gain this is by building Lean thinking into their personal practices and behaviors one piece at a time. Some simple projects proposed to SPO staff for beginning this process included:

- 5S the office or email inbox.

- Set up an electronic *andon* system based on paging and email.
- Apply "standard work" to repetitive practices in the group (ex: monthly status reports).
- Value stream map a simple process (<10 steps) under his or her personal control.

Due to traditionally hierarchical and management-by-results leadership style, if leaders develop and regularly pay attention to Lean metrics then employee behaviors will begin to change. Leaders can also show their personal interest by walking around and talking with employees about Lean. Factories have a well-established leadership practice for managing safety by walking around. Including Lean into this practice will help embed Lean thinking into the culture just as it did for safety.

How a leader responds to and behaves in a crisis could be another powerful method for embedding Lean culture in SPO. To maximize the impact of this mechanism though, leaders need to help employees understand how the actions a leader takes in a time of crisis tie into Lean by making the actions intentional and explicit. For example, before launching the next taskforce a leader could explicitly decide to take on a coaching role instead of leading the task force directly.

The other mechanisms are also important if they are closely and intentionally linked to the Lean cultural shift. Changing the incentive system is powerful way to drive a change in behavior. As part of this year's Focal messages the SPO leadership team decided to include an expectation for supporting Lean. This message will help drive the Lean effort.

> "In 2008, SPO expects to make significant progress on the Lean Journey that began in 2007. For SPO to be successful, every SPO employee needs to play a key part in making this cultural shift happen, by learning and embracing the Lean Philosophy, and applying it to identify and remove waste from our work environment. I look forward to your 2008 contributions on this key [yearly performance review] expectation."

8. Why Are Lean Organizational Capabilities and Healthy Relational Contracts Critical?

8.1. Respect for People and Continuous Improvement

The two pillars of The Toyota Way 2001, Respect for People and Continuous Improvement, create a reinforcing system dynamics causal loop that strengthens the capability of the organization over time (see Figure 29).
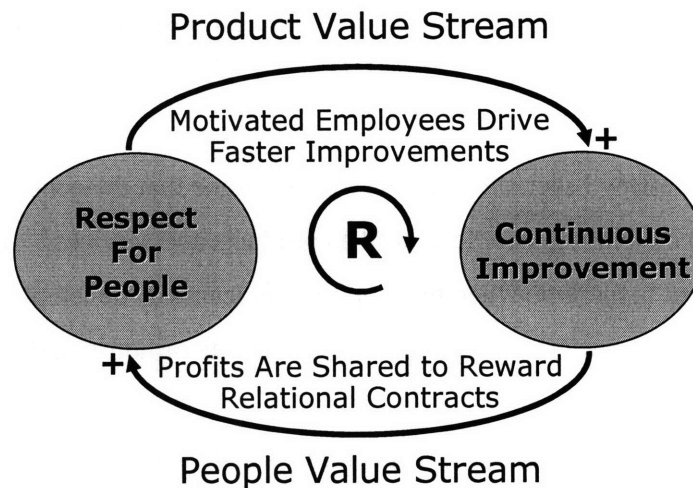
Figure 29: Respect for People/Continuous Improvement Causal Loop (adapted from *The Toyota Way*)

Here Toyota's concept of "respect for people" translates into highly motivated employees that drive continuous improvement faster. New capability from "continuous improvement" efforts adds more value with less waste and increases the firm's profits. Management subsequently shares these increased profits with employees to reward them for their efforts. This closes the loop with management fulfilling and thereby strengthening the firms "respect for people". This reinforcing, virtuous cycle is the engine that drives the Toyota Way.

Product Value Stream

Motivated and capable employees generate continuous improvements by adding more value to and eliminating waste from the product value stream. This is accomplished by applying a variety of Lean tools and techniques including 5S, standard work, *andon* systems, continuous

flow, and just-in-time. Behind these Lean tools lie the four unspoken rules of the Toyota Production System as described by Spear and Bowen:[65]

1) Activities: All work shall be highly specified as to content, sequence, timing and outcome.

2) Connections: Every customer-supplier connection must be direct, and there must be an unambiguous yes-or-no way to send requests and receive responses.

3) Flows: The pathway for every product and service must be simple and direct.

4) Improvements: Any improvement must be made in accordance with the scientific method, under the guidance of a teacher, at the lowest possible level in the organization.

People Value Stream

In *Toyota Culture*, Jeffrey Liker and Michael Hoseus argue that the concept of value stream mapping applies to developing people as well as products and services.[66] In the "people value stream," value added is the time when the employee is learning, developing, and being challenged. Time spent not growing or improving is waste or non-value added in this context.

Just like in the product value stream, Toyota employs several tools to improve the people value stream including coaching, on-the-job training, job rotations, and standard job instructions. Liker describes these in detail in *Toyota Talent*. Similar to the four unspoken rules, it is the opinion of the author of this paper that the two unspoken frameworks behind the development of people value stream are 1) Steve Spear's Four Capabilities of the Operationally Outstanding and 2) Relational Contracts as described by Robert Gibbons and Rebecca Henderson.

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[65] Spear, Steven, and H. Kent Bowen, "Decoding the DNA of the Toyota Production System," Harvard Business Review, September 1999, pg. 97.

[66] Liker, Jeffrey and Michael Hoseus. *Toyota Culture: The Heart and Soul of the Toyota Way*, McGraw Hill, 2008, pg. 38.

8.2. Lean Organizational Capabilities

Building on the framework of the four rules, Spear puts forth a model to explain why Toyota and other Lean companies learn and improve performance faster than their competitors that have access to the same set of inputs in terms of labor, equipment, and suppliers. Spear argues that coupling the process of doing work with the process of learning to do work better helps to create a community of scientists. He proposes four capabilities that make a group operationally outstanding. These Lean Organizational Capabilities are:[67]

1) All work is designed as a series of nested experiments where work specifications are specified before starting and tests are embedded to indicate gaps between what is actually happening and what was predicted.

2) All problems are addressed when and where they occur

3) Local knowledge is shared throughout the organization by means of joint (experimental) problem solving.

4) Those more senior build the capabilities [1 through 3] of those more junior through coached, mentored, and directed (experimental) problem solving.

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[67] Spear, Steven J. "Why General Motors Lost and Toyota won – Working Paper: 05-080," June 2005 pg. 6.

4
Vertical cascade of training
coaching, teaching, and help

3
New knowledge is shared
systematically by collaborative
problem solving

2
Problems are addressed
when and where they occur
Problems are solved
with fast-paced, low-
cost experiments

1 Specified work designs capture BKMs for how to succeed
Imbedded tests refute assumptions implicit in the design

Work Activities	**Connections/Links**	**Flows/Pathways**
Standardized Work	Pull Systems	Simple
Error Proofing	Just In Time (JIT)	Direct
	Minimal Inventory	Unambiguous

Figure 30: Lean Organizational Capabilities (adapted from Spear)[68]

Figure 30 is a pictorial representation of these four capabilities. These four capabilities are linked closely with Spear's Four Rules. Designing work as structured activities, binary connections, and simple flows with built in self-tests enables *jidoka* and capability #1. Improving work using the scientific method quickly at the point of activity is capability #2. Sharing local results from efforts to find and fix problems horizontally across an organization is capability #3. Lastly, developing problem solving abilities vertically up and down the management chain through coaching and mentoring is capability #4. An operationally outstanding organization has all four of these capabilities.

The Lean leadership behaviors of coaching and mentoring employees on designing work using the four rules supports capability #1. Staying in touch with the *gemba* and management by

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[68] Ibid.

means are leadership practices that enable leaders to help address problems when and where they occur (capability #2) and with sharing what the team learned with others (capability #3). Lastly, servant leadership is critical for developing others and strengthening the people value stream (capability #4).

SPO is striving to replicate this organizational capability model. For example, leaders are currently driving standard work practices across the organization (capability #1). The leadership team is also responsible for personally training and mentoring their respective organizations (capability #4). An internal Lean Shared Learning Forum was also chartered to share best-known-methods for driving Lean culture across the organization (capability #3). SPO is also reaching out to other groups within Initech that are also undertaking a Lean transformation. The cumulative effect of these capabilities will strengthen SPO's people value stream.

8.3. Relational Contracts

Another key to developing the people value stream is relational contracts. Similar to the term "social contracts" commonly used by sociologists, relational contracts are "informal agreements and unwritten codes of conduct that powerfully affect behavior, both within firms and between. … [relational contracts] are often informal quid pro quo between co-workers, as well as unwritten understandings between bosses and subordinates about task-assignments, promotions, and termination decisions."[69] Relational contracts help bypass problems with formal contracts by allowing parties to use their specific knowledge about a situation and to adapt to a dynamic environment as new information becomes available. For example, a formal contract typically must be specified beforehand and verified afterwards by a neutral third party. Relational contracts can be based on observed outcomes afterward by both parties with minimal upfront costs for specifying terms beforehand.

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[69] Gibbons, Robert. "Relational Contracts," MIT Lecture Notes, Spring 2007, pg. 6.

Relational contracts can exist between a firm and its suppliers, customers, employees, and other stakeholders. Both parties have two choices with regards to relational contracts, either 1) cooperate and receive the related benefits or 2) defect and face the consequences of punishment when caught. Analyzing the strategies for cooperating or defecting with Nash equilibrium theory in an infinitely repeated game yields interesting results. In a well-structured relational contract, if players are sufficiently patient, then it is optimal to cooperate and forego the short-term temptation to defect for the long-term gain of ongoing cooperation. This concept is shown graphically in Figure 31 where the long-term payout (area below the cooperation line) is greater than the benefit from defection and punishment (area below the defection and subsequent punishment lines).
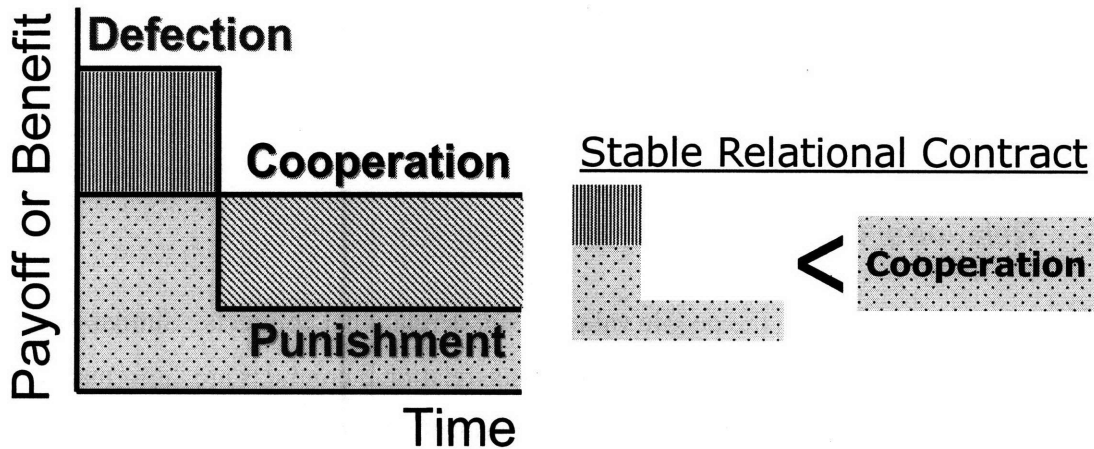
Figure 31: Graphical Construct of a Relational Contract

A verbal example of cooperation within a relational contract is:

- **Employee:** I promise to work hard and do what is good for the company and shareholders.
- **Manager:** I promise to observe your work and fairly reward you for your effort.

In this example, both parties face the temptation to defect and break this informal contract. The employee can make it appear as if he or she is working hard and the manager can chose to not reward the employee's efforts to save money. However, both risk punishment from the other. The manager may eventually realize the employee was not working hard at all and the

employee will not be motivated to work hard if he or she does not receive fair reward for his or her efforts. That said, if the relational contract is structured with appropriate payoffs for cooperation, defection, and punishment, the parties would both favor Nash equilibrium for cooperation.

There are many forms for relational contract payoffs that are not constant. For example, Toyota may have relational contracts with increasing returns for cooperation (see Figure 32). Verbally, one such relational contact could be:

- **Employee:** I promise not only to work hard but also to strive to improve work everyday, at best speed using the Toyota Production System.
- **Manager:** I promise to observe your work, help you when you have problems, coach you, and fairly reward you for your effort.
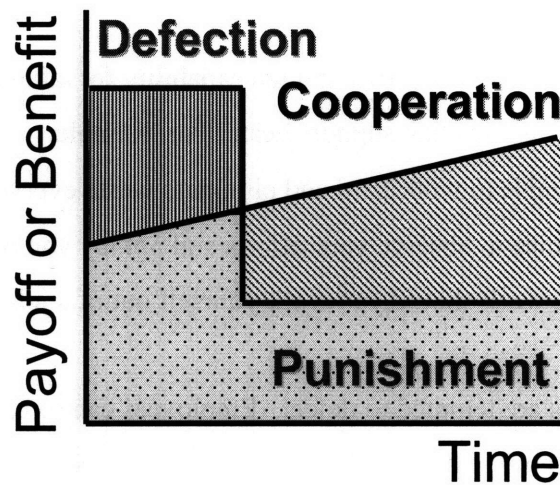
Figure 32: Relational Contract with Increasing Payoff for Cooperation

This is a "healthy" relational contract where over time there is less temptation for defection for both parties and increasing rewards for ongoing cooperation. Strong, healthy relational contracts build mutual trust between management and employees as well as between the firm and suppliers/customers. This mutual trust is the foundation for Toyota's Respect for People.

The relational contracts within SPO have suffered over recent years due in parts to restructuring, headcount reductions, tight merit budgets, and failed programs-of-the-day that

were pushed by management yet not supported in the end. However, relational contracts can be repaired over time. Organizations like SPO can begin with simple relational contracts and overtime grow the capability to tackle difficult relational contracts. One example of a simple relational contract that parts of SPO is working towards for supporting an *andon* system is:

- **Employee:** I promise to notify management of a problem when I find one.
- **Manager:** I promise to not punish you for raising problems. If you have a problem, I will respond immediately and ask, "What is the problem and how can I help?"

Here both parties are tempted to defect: employees can hide problems and managers can scold employees for raising them or not come to their aid. This destroys trust. Without trust in management, employees are reluctant to admit and highlight problems. However, if the parties cooperate, employees are coached and managers know that problems will be raised quickly when found before they become bigger ones.

Over time, the parties build mutual trust and the capability for taking on more complex or challenging relational contracts that support Lean. For example:

- **Employee:** I promise to work hard and eliminate waste everyday from my work.
- **Manager:** I promise to observe your efforts and not lay you off but rather move you to more value-added work should you work yourself out of a job.

Here again, both parties are tempted to defect. Employees can refuse to improve continuously and managers can lay people off instead of moving them to more value-added work.

Studying Toyota's management practices reveals many relational contracts related to areas such as team incentives, performance reviews, supplier development, customer orientation, and environmental stewardship. A strong, healthy, and complimentary set of Lean relational contracts is crucial to developing the people value stream. The Toyota Production Systems is designed to highlight and fix problems and Toyota's people development systems produce employees that are willing and able to do the same.

Leading Lean will not be easy for SPO or the other Initech organizations. Many other companies have failed to replicate Toyota's remarkable success by copying Toyota's tools. Blindly copying Toyota's leadership norms will not likely produce similar results. Rather, much like Spear and Bowen's approach to decoding the DNA of Toyota, Initech's Lean leaders should strive to understand the hidden models and rationale behind Toyota's leadership norms. Then leaders need to read the organization and experiment on what concepts work best for recreating the reinforcing causal-loop linking Respect for People and Continuous Improvement. Lean leadership behaviors, cultural embedding techniques, Lean organizational competencies, and healthy Lean relational contracts need to be crafted to fit each unique organizational context and environment.

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9. Creating a Foundation for Future Work

9.1. *Potential Problems with the Lean Transformation and Countermeasures*

Looking forward in time, SPO's Lean transformation will take several years, and the Lean journey itself will never end. As part of building a strong coalition and creating a common vision, SPO's leadership team spent time prognosticating potential problems with the Lean transformation and discussed possible countermeasures. Here is a condensed list of these potential problems:

- The formal definition for value-added activity implies that most employees are working on necessary but non value-added tasks
- There is no compelling incentive for Lean thinking for most SPO employees
- Employees will not be motivated to make their work more efficient if they are worried about working themselves out of a job, and the company cannot make promises concerning life-long employment.
- Employees perceive Lean as a "new flavor of the month" like previous efforts and this will impede the cultural shift.

While some of these potential problems were proactively addressed, some are still potential problems. One of the most concerning in the author's perspective is that the workforce perceives Lean as a management fad or a program-of-the-month. Over the last several years, the group has undergone multiple reorganization efforts and many efficiency programs like six-sigma, GE workouts, Fourth Generation Management, and Business Process Management. To help better draw a distinction between where Lean tools overlap with tools from prior programs, the following collection of Venn diagrams was developed and shared with the leadership team:

Legend:
GREEN: Area of alignment with lean
RED: Area out of alignment with lean

Kaizen

CIP = Kaizen everyone everywhere everyday

CIP

Value-Stream Mapping

Lean maybe more explicit about "Value" and "Waste"
80/20 rule for mapping
kaizen workshop VSM <1wk

Inventory of all business processes
BPI ~ kaizen workshop
BPR ~ kaikaku (breakthrough kaizen)
Enterprise Business Architecture ~ Lean Enterprise VSM
BP Managers ~ Value-Stream Manager
"As-Is"=Current State / "To-Be"=future state
Observations = go to Gemba and directly observe work

Business Process Management

Scientific Method Plan-Do-Check-Act

Lean focuses on waste
Lean is both short and long term
Lean Kaizen: everyone, everywhere, everyday

6s focuses on variation
6s projects tend to be long term
Green belts/Black belts do projects

Structured Problem Solving (DAMAIC ~ PDCA)
Reduce variation or "mura" and "heijunka"
Tiered Mentoring: 6s Black Belt = Lean Sensei

Six Sigma

Session meets outside of work
Management leads/decides

GE Workout Session

Both strive to reduce bureaucracy and waste
Employee has opportunity to improve daily operations
Management works for employees

Lean decisions made at lowest feasible level
Meet where work is

Kaizens & Breakthrough Kaizens

Productivity Consultants

Employee productivity is a key metric
Lean targets waste not headcount specifically

MORE ALIGNMENT

DAYS | WEEKS | MONTHS | YEARS
← ← ← Typical Project Life Cycle → → →

Figure 33: Comparison of Lean Tools Alignment

Each of these prior programs has had its day, and now some employees perceive Lean as another program of the month. SPO management needs to be careful about utilizing management directives and techniques used to roll out prior programs to avoid the perception that Lean is a program-of-the-month. For example, management should avoid creating mandatory training classes, setting project or improvement idea quotas, or marketing Lean like prior programs (i.e. badges, coffee mugs, posters, etc.) if at possible. Instead, SPO's leadership team should spend their time on practicing Lean for themselves and integrating Lean behaviors into daily management practices.

In the longer term, while Lean aligns with many aspects of SPO's culture, there a few notable exceptions. Areas within the existing culture that are divergent with Lean include concepts like rewording firefighters, not sharing knowledge, and not valuing standardization. Some other parts of Lean that are not well aligned with SPO's current culture include concepts like:

- Employees are encouraged to make problems visible early
- Lean welcomes problems as opportunities
- Leaders go to where the work is, where value is created
- Lean drives for small changes, everyone, everyday

Developing a strategy for addressing each area of misalignment is an important future step for SPO's leadership team. Other unexpected problems are also possible. SPO's leadership team should continue to regularly reflect on the progress of the transformation and make reflection part of normal business.

9.2. *Operating Systems and Roadmaps*

Another area for future work is to continue to refine how Lean will integrate with SPO's current systems to create a complimentary operating system. SPO needs to scrutinize which aspects of Lean make sense for the organization to integrate and focus. The organization should not blindly embrace all aspects of Lean, but rather carefully select a few focus areas for now for the whole organization to work towards over the next several months. Figure 34 is one early draft proposal for what a high-level operating system framework could look like for SPO. Adapted from *The Hitchhiker's Guide To Lean*,[70] this pyramid shows the four primary elements of a candidate operating system. SPO's leadership team needs to develop a system as a next step to help align and integrate the organization's dispersed Lean thrusts.

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[70] Flinchbaugh, Jamie, Andy Carlino, and Dennis Pawley. The Hitchhiker's Guide to Lean: Lessons from the Road. Dearborn, MI: Society of Manufacturing Engineers, 2006, pg. 94.

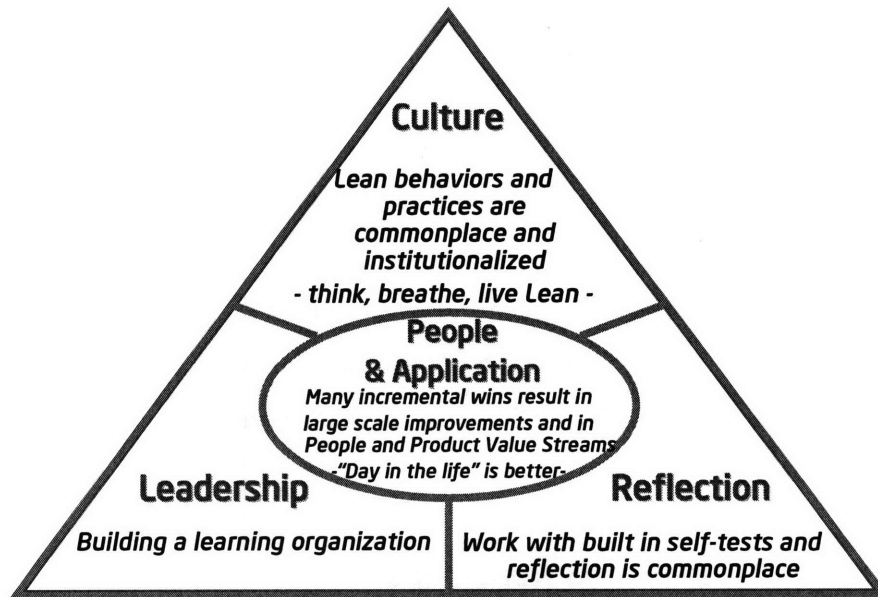**Figure 34: Proposal for an SPO Lean Operating System (adopted from Flinchbaugh et. al.)**

Another next step is to update SPO's high-level Lean transformation roadmap (see Figure 35).
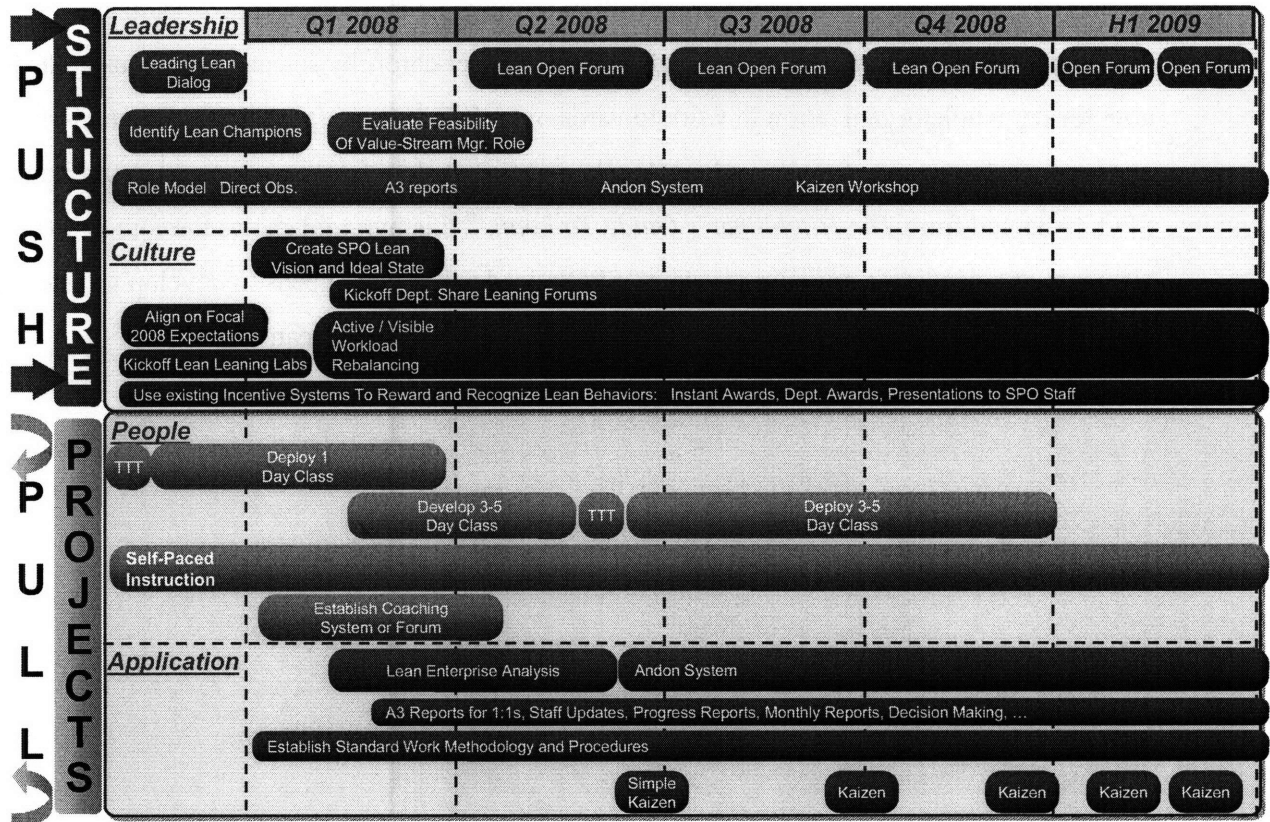

Figure 35: SPO Lean Transformation Roadmap- Q4 2007

This roadmap was created to help align all employees on what the Lean transformation plan looks like over the next year. It contains some elements that will be "pushed" in a top-down fashion (Leadership and Cultural change) and some elements that groups will "pull" or ask for when ready. Some groups are moving forward with Lean faster than others are. As a result, it is important that there is a flexible timeline for rolling out Lean training and applications to different groups. Updating a version of this high-level Lean roadmap will ensure the organization stays aligned on the Lean journey.

9.3. Lean Enterprise Analysis

Another highly recommended next step is for SPO to complete a Lean Enterprise Analysis using methods developed by MIT's Lean Advancement Initiative. This Lean Enterprise Assessment includes the following steps 1) Define the Enterprise, 2) Collect Data, 3) Construct the Current State Perspective, 4) Identify Enterprise Opportunities, 5) Describe the Future State Vision, and 6) Create Transformation Plans[71]. As part of a strategic planning meeting, the leadership team was exposed to a couple of Lean Enterprise Analysis techniques. The team completed an X-Matrix and several stakeholder value delivery charts. This is just a small part of a much larger, comprehensive enterprise analysis methodology.

Before SPO progresses too far down their Lean journey, the leadership team should take the time to do a complete Lean Enterprise Analysis. This will ensure that the employee's efforts to reduce waste and improve business processes will be adding the most value possible from a system-wide perspective. Postponing this type of analysis puts the organization at risk for not working on the most important areas or making prior improvement efforts obsolete.

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[71] Nightingale, Deborah J. "What is a Successful Surveillance System?" MIT Lean Advancement Initiative, 2008, captured from http://web.mit.edu/cbi/research/workshopdocs/Nightingale.pdf on April, 2008, pg. 22.

9.4. Future Lean Focus Areas

There is an infinite number of ways SPO could implement Lean thinking in the future. It is the opinion of the author that SPO should focus their efforts in the following areas for the near-term:

1) Standardization: In addition to creating standard processes and standard work, SPO needs to foster a culture for valuing standardization. Employees and managers should feel uncomfortable when performing a business process without standard work in place. This behavior also needs to be valued as part of employee performance reviews.

2) Reduce the dependence on local knowledge that is not shared: SPO's business processes are held together with tribal knowledge of hard working employees. The culture for tolerating and even rewarding employees for tribal knowledge is unsustainable and doomed for failure with the increasing levels of product and process complexity compounded with flat headcount constraints. Tribal knowledge should not be tolerated. SPO should strongly consider adopting cookbooks, also known as blue books, for capturing and communicating tribal knowledge. Other knowledge management tools like wiki could also be useful.

3) Implement *jidoka* and visual management: After standardization and the reduced dependence on tribal knowledge, SPO next needs to focus on implementing *jidoka* and visual management systems. Work needs to be designed with built-in self-tests that automatically signal an abnormal condition. Machine work needs to be separated from human work. Visualization and management by exception are the primary ways the organization can scale its productivity to handle an increasingly dynamic, complex workload.

10. Conclusion and Reflection

SPO's Lean journey is well underway. Standard work, direct observation, and experimentation using A3s is well underway. The Leadership team needs to be careful about not focusing too much on tools and near-term results. The primary focus needs to remain on creating a sustainable Lean culture and becoming proficient at integrating Lean behaviors and practices into daily activities. This "culture first" approach may not generate as many near-term wins as a "tool first" approach. However, if the hypothesis of this thesis proves to be true, a sustainable Lean organizational competency is a more likely outcome. SPO leaders should continue to develop the people value stream in parallel with the improving the product value stream through strong, healthy relational contracts and Lean organizational capabilities.

11. Appendix A: List of Acronyms and Foreign Terms

5S: Sort, Simplify, Sweep, Standardize, Self-Discipline: a visually-oriented system for organizing the workplace to minimize the waste of time.

andon: Japanese word for lantern. Visual control device that allows anyone to see and manage the real-time status of the value stream

CONWIP: Constant Work in Process – an inventory control methodology which caps the total amount of WIP that can enter a subset of operations.

gemba: place where value is created (i.e. the shop floor an office cubicle)

genchi genbutsu: "going and seeing" for yourself

HPM: High Precision Maintenance was based upon the Toyota's Total Productive Maintenance program.

Jidoka: automation with human intelligence. Separate machine work from human work and stop the line when there is an abnormal condition to prevent defects from moving down line.

Kaizen: To make a change for the better. Continuous, incremental improvement of an activity to create more value with less *muda* (waste).

Kanban: A signal, often a card attached to supplies or equipment that regulates pull by signaling upstream production and delivery.

JIT: Just-In-Time refers to an inventory strategy implemented to minimize work in process, cycle-time, and the cost. A system for producing and delivering the right items at the right time in the right amounts. Just-in-Time approaches just-on-time when upstream activities occur minutes or seconds before downstream activities, so single-piece flow is possible

Muda: Japanese word for waste

Pull system: A system of cascading production and delivery instructions from downstream to upstream activities in which nothing is produced by the upstream supplier until the downstream customer signals a need. Opposite of a push production system.

SPO: Supply Planning Operations

Standard work: A precise description of each work activity specifying things such as cycle time, takt time, the work sequence of specific tasks for each team member, and the minimum inventory of parts on hand needed to conduct the activity.

Takt time: Derived from the German word for meter, it refers to pacing work according to customer demand. The available production time divided by the rate of customer demand.

TPS: Toyota Production System

Value stream: The specific activities required to design, order, and provide a specific product (or service) — from concept launch to order to delivery into the hands of the customer.

VSM: Value Stream Map is a Lean tool that maps out material and information flow to help visualize the current reality and identify improvement opportunities.

12. Appendix B: Sample of Self-Paced Lean Training

Self-Paced Lean Training
rev 1.2
Basics

Objective

The content here provides an introduction to the basic concepts of Lean, including the rule and principle based approach. The content reinforces these concepts with stories about Lean culture from Toyota and other Lean practitioners.

Articles and Papers

Link(s)	#	Title	Author(s)	pages	Summary	Purpose (hypothesis)
	1	How Toyota Turns Workers Into Problem Solvers	Interview with Steven J Spear	4	Toyota's reputation for sustaining high product quality is legendary. But the company's methods are not secret. So why can't other carmakers match Toyota's track record? HBS professor Steven Spear says it's all about problem solving.	Background reading for "DNA" article and rationale for studying Toyota
	2	Decoding the DNA of the Toyota Production System	Steven J Spear H. Kent Bowen	11	The Toyota Production System has been intensively researched, yet what really happens inside the company remains a mystery. Many others have tried to adopt Toyota's system, but few have managed to imitate it successfully. The authors believe this is because observers have not been able to resolve the paradox of the system, that its rigid specifications are the very thing that makes Toyota's flexibility and creativity possible. They describe three rules of design and one rule of improvement that form the essence of Toyota's system.	A first pass to work design and problem solving. A cultural shift is required to successfully replicate Toyota's success.
	3	Learning To Lead At Toyota	Steven J Spear	9	One reason imitators fail to replicate Toyota's success is that they fail to recognize the underlying principles, focusing instead on specific tools and practices. This article tells the other part of the story. Toyota inculcates managers with principles. The company teaches employees at all levels to achieve continuous improvement through quick, simple experiments rather than through lengthy, complex ones. Managers should coach, not fix - directing employees but not telling them where to find opportunities for improvements.	More on problem solving with an implicit stab at how Lean principles can be applied to areas beyond manufacturing like people development.
	5	Beyond Lean	Jamie Flinchbaugh	22	A Lean Learning Center consultant expands on the "DNA" article. There are far too many descriptions of lean systems for all of us to be speaking the same language. Some interpreted lean as a collection of tools (5S, JIT, kanban) and others have described lean as working people harder/smarter, kaizen, or Total Quality Management. At a high level, Lean systems give people at all levels the skills and a shared way of thinking to systematically drive out waste by designing and improving work as activities, connections, and flows. This article introduces five principles to guide thinking.	Reflection on the "4 Rules" of Lean and introduction to the "5 Principles" of Lean. "Lean starts with rules - not tools"
	6	Getting Lean "Right"	Jamie Flinchbaugh	2	There is more than enough information on "what" lean is, more than enough information on lean tools, but still very little useful information on HOW to take on a lean transformation and how to lead the change. Every company's lean journey starts under different circumstances, and so there can be no one recipe, no "right way." But there are many factors to consider to help you succeed before embarking on your lean journey.	Lessons learned from prior companies implementing a Lean transformation.
	7	The Reality of Lean Manufacturing	David Meier	1	Simply stated an objective of a lean system is to FORCE the need for waste elimination and continuous improvement. The challenge is to resist our normal human instinct to seek comfort rather that discomfort and the stress of a lean system can be very uncomfortable if it is not reliable.	Helps explain how Lean should "feel"
	8	No Satisfaction at Toyota	Charles Fishman	7	What drives Toyota? The presumption of imperfection--and a distinctly American refusal to accept it.	Insight into Toyota's culture

Videos

	#	Title	Format	#mins	Summary	Purpose (hypothesis)
	1	The Toyota Way	YouTube Stream	4:19	Overview of Toyota's Production system	Introduction to Toyota's culture
	2	Value Stream	YouTube Stream	0:57	Basic animation and explanation of a Value Stream	Conceptualize a value stream
	3	Womack Lean Concepts	realPlayer	4:52	Jim Womack introduces the basic concepts of Lean including Customer Value, Value Stream, Flow, Pull, and Perfection.	Brief overview of Lean basics from a master teacher
	4	Womack Lean Thinking	realPlayer	2:15	Jim Womack explains Lean Thinking and why Lean is hard.	Lean is not a program

Books

	#	Title	Author(s)	#pgs	Summary	Purpose (hypothesis)
	1	The Elegant Solution	Matthew May	236	Explains Toyota's philosophy of team-based innovation and creative business practices that drives Toyota's creativity, with a reported one million ideas from its employees being implemented each year.	Provides insight on and examples Lean culture. Everyone is improving their own work.
	2	Hitchhiker's Guide to Lean	Jamie Flinchbaugh Andy Carlino	196	Book summarizes lessons learned over years of exploring the Lean. Lean leaders add value by changing things, moving them forward, and producing different results than the day before. To lead, you must go beyond creating a vision and develop the vehicle that will deliver it. The book covers principles and thinking, leadership moves, the roadmap for transformation, common pitfalls, building an operating system, accounting, material management, Lean in service organizations, and how individuals can apply Lean to improve themselves.	Provides more insight on and examples of the "5 Principles" of Lean. "How-To" guidebook for implementing a Lean transformation.

Reflection

Questions	Notes
Who are your customers?	
What do your customers value from your work?	
Why is your work important?	
How well is you work structured?	
How well does your work connect with others?	
How is work improved?	

13. Appendix C: Testimonial from a Frontline Worker

The following description provides context for a story about a front line autoworker that experienced a Lean cultural transformation. It was 1982 and trade friction between the US and Japan over the number of car imports was growing. A GM plant in Fremont, CA was in a death spiral – worst in quality, output, cost,...

- Double digit defects in every car / slowest cycle time
- Labor conditions were toxic and violent – many strikes / back log of 5000 union grievances
- Absenteeism was over 20%
- Rampant drug/alcohol abuse on site – special cleaning crews to remove liquor bottles and drug paraphernalia from site after every shift
- GM threw in the towel in Feb 1983 and closed the plant

NUMMI (New United Motor Mfg. Inc) chartered in 1983 to make Corolla / Chevy Prizm

- Toyota would provide cash, management, and of course TPS
- GM provided same plant, union terms, and workers AND a no layoff policy

This time the outcome was different. Here is what Toyota did:

- Flattened GM organization with over 14 management levels to 3 and reduced over 100 job codes to 1 – "team member"
- Full production began in 1985 and by 1986 NUMMI was the highest quality GM plant (1/2 cycle time, 12->1 defect per vehicle, 20%->3% absenteeism)

The following testimonial is from an interview with a career autoworker at the GM/Toyota joint venture, NUMMI. This worker experienced a dramatic cultural shift associated with the management transition from a GM style to the Toyota Way.

"Never in a million years would I tell you this work is creative. Then Toyota took over twenty years ago. They teach us their system then say to us, "we want you to tell us how to make it better." We went from "just do your job" with GM to "no one knows the job better

than you" with Toyota. They teach us how to solve problems. They turn us loose in here! They say, stop the line anytime if something's wrong. I was floored. They think I can make their systems better? They're giving me the power to stop production? That right there changed my life. All of a sudden, I'm looking for ways to fix problems, make improvements, basically get rid of anything that was stupid. Get rid of waste, they said. Perfect the operation, they said. So now all of a sudden, I'm using my head, I'm the expert, I'm creating new procedures. There you go, creating. I guess there's an art to it, yeah. It's not like I designed a Corolla or anything, but I started getting some real pride back. Before, we didn't care, we were ashamed to say where we worked. We'd laugh when we saw a car that came out of here. Now we feel like, hey, I built that! The place got cleaned up. We stopped fighting. We all wore the same uniforms even managers. We started thinking, hey, people are driving these cars, let's make them safe. My mark's all over this plant, like everyone else's. One year we did like eight thousand ideas. The job itself wasn't creative, never will be, but our job was to be creative. And I guess if you can be creative in this line of work, you can be creative anywhere.[72]"

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[72] May, Matthew E. *The Elegant Solution: Toyota's Formula for mastering Innovation*, Free Press, 2007, pg.24.

X-Matrix (center diamond): **Metrics** (top) / **Strategic Objectives** (right) / **Stakeholder Values** (bottom) / **Key Processes** (left)

Metrics (top):
- Manufacturing Flexibiility
- Customer Flexibility
- Performance to Commitments
- Retention Rate
- Recordable rate
- Training
- Data Quality
- Committed Supply
- Discretionary Spending
- Head count and Productivity/HC Avoidance
- % Aged Inventory
- Pipeline Inventory

Strategic Objectives (right):
- Customer - Responsiveness
- Execution - Meet Supply Chain Commitments
- Inventory - Meet Inventory Goals
- Supply Chain Foundation – Efficiency, Partner Relationships
- People- safety, enrichment and training, retention

Stakeholder Values (bottom):
- Safe, challenging, diverse environment
- Clear Communication on Priorities and Direction
- Rapid Turnaround Time on Info and Direction
- Data Quality
- Linearly and Loaded Factories
- Cost Reduction and CIP
- Supply availability

Key Processes (left):
- Monthly Build Plan
- NPI
- EOL
- Production Scheduling
- Inventory Planning
- Materials Planning
- Performance Reviews
- Task force
- Hotlist
- Capability development

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