

PART I – LEAN PRINCIPLES	
<i>Introduction: Lean Thinking versus Muda</i>	
Lean Thinking	<ul style="list-style-type: none"> ➤ <i>Lean thinking</i> is doing more with less while providing customers exactly what they want when they want it ➤ <i>Lean thinking</i> is the antidote for wasteful activities (known as muda in Japanese) ➤ The five principles of <i>lean thinking</i> <ul style="list-style-type: none"> • Specify Value – define value from the customers perspective • ID the Value Stream – identify the set of value adding activities • Ensure Flow – ensure that all value-creating steps in the value chain flow • Establish Pull – let customer pull product as needed vs. pushing product • Work to Perfection – use continuous improvement to seek perfection
Value	<ul style="list-style-type: none"> ➤ Specifying <i>value</i> is the critical first step in lean thinking ➤ <i>Value</i> is defined by customer and expressed in terms of a specific product ➤ Typical problems with specifying <i>value</i>: <ul style="list-style-type: none"> • American Value Issues – too focused on short term profits • German Value Issues – too focused on gee whiz gadgets not needed by customer • Japanese Value Issues – too focused on “buying Japanese” in relationships
Value Stream	<ul style="list-style-type: none"> ➤ The <i>value stream</i> is the set of actions required to satisfy a customer need <ul style="list-style-type: none"> • The value stream includes activities both internal and external to the firm ➤ A typical <i>value stream</i> consists of three different categories of steps or tasks: <ul style="list-style-type: none"> • Problem Solving Tasks – from product conception, design, launch • Information Management Tasks – from order taking to scheduling • Physical Transformation Tasks – from raw material to delivery ➤ A <i>value stream</i> analysis identifies three types of actions that satisfy a customer need: <ul style="list-style-type: none"> • Steps that create value • Steps that do not create value, but are unavoidable (Type One Muda) • Steps that do not create value, and are immediately avoidable (Type Two Muda) ➤ Work to eliminate the last two types of actions, since they are wasteful activities
Flow	<ul style="list-style-type: none"> ➤ After eliminating muda from the value chain, ensure that remaining steps create <i>flow</i> <ul style="list-style-type: none"> • Requires the elimination of ‘departmental’ and ‘batch-and-queue’ thinking ➤ Continuous Flow – product continuously worked from raw material to finished good <ul style="list-style-type: none"> • Uses low-volume production as opposed to high volume assembly lines • Aligns organizational design and employee incentives with creating value • <i>Continuous flow</i> facilitates improvement in two ways: <ul style="list-style-type: none"> ▪ Kaizen – evolutionary change - continuous, incremental improvement ▪ Kaikaku – revolutionary change - radical improvement
Pull	<ul style="list-style-type: none"> ➤ <i>Pull</i> is a method of manufacturing in which each process withdraws the parts it needs from the preceding process when it needs them, in the exact amount needed. ➤ In its purest form, <i>pull</i> uses customer need as a signal to begin all upstream activities <ul style="list-style-type: none"> • Combats building an pushing unwanted goods/services (often thru discounts) • Customer demand becomes more stable in a <i>pull</i> system
Perfection	<ul style="list-style-type: none"> ➤ <i>Perfection</i> is a realistic goal once the first four principles of lean thinking are in place <ul style="list-style-type: none"> • Transparency within the value chain ensures firms work towards adding value • Employee incentives are aligned with improvement

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Lean Enterprise	<ul style="list-style-type: none"> ➤ A <i>lean enterprise</i> is a continuing conference of all concerned firms to create value <ul style="list-style-type: none"> • Customer value is only maximized when firms implement lean thinking together • Requires transparency in the activities of the company, suppliers, and customers
Muda ("Waste" in Japanese)	<ul style="list-style-type: none"> ➤ <i>Muda</i> is any human activity which absorbs resources but creates no value <ul style="list-style-type: none"> • <i>Excess Inventory</i>– Maintaining more parts than immediately needed - stockpiling • <i>Over Production</i> – Running machines efficiently, but producing items not needed • <i>Excess Motion</i> – Unnecessary product movements • <i>Human Touches</i> – Unnecessary human movements • <i>Transportation</i> – Unnecessary transportation of goods • <i>Waiting</i> – Employees waiting for an upstream operation to deliver product • <i>Customer Defects</i> - Goods and services which don't meet customer needs
Taiichi Ohno (1912 -1990)	<ul style="list-style-type: none"> ➤ <i>Taiichi Ohno</i> is a Toyota executive who defined lean thinking principles ➤ <i>Ohno</i> focused on achieving continuous flow and pull for low volume production <ul style="list-style-type: none"> • Henry Ford achieved flow for high volume production, but w/excess inventory • <i>Taiichi Ohno</i> focused on "quick change-overs" and "right-sized" machines to achieve flow in smaller lots with minimal inventory ➤ <i>Ohno</i> coined some catchy phrases <ul style="list-style-type: none"> • "Companies making even a modest profit never use Lean Thinking" (i.e. sometimes it takes a crisis to make people want to change) • "When you have lots of inventory, you are always a part short" • "Common sense is always wrong" ➤ <i>Ohno</i> helped establish the <i>Shingijutsu Company</i> to promote lean thinking (<i>Shingijutsu</i> means 'new technology' or 'better way' in Japanese)
Technology's Role in Lean Thinking	<ul style="list-style-type: none"> ➤ Technology is important, but it is slowly impacts the majority the value chain ➤ Technology is a game rapid game changer in only a small portion of industries
Chapter 1 - Value	
<i>Chapters 1 – 5 include real world examples that support each of the five 'Lean Thinking' principles. I have not included information about these examples in this study sheet – consult the book for more details.</i>	
Value	<ul style="list-style-type: none"> ➤ <i>Value</i> is defined by customer and expressed in terms of a specific product
How to Specify Value	<ul style="list-style-type: none"> ➤ Challenge the traditional definitions of <i>value</i> <ul style="list-style-type: none"> • This is difficult since producers typically want to make what they are currently making and customers only ask for a variant of what they are currently getting. • Develop a dialog with customers to identify where tradeoffs can be made to increase the value to the customer (i.e. is delivery speed as important as quality) ➤ Define <i>value</i> by looking at the whole process and not just pieces of the process <ul style="list-style-type: none"> • Maximizing each sub-process does not necessarily maximize the whole ➤ Establish a target cost for each process if no waste existed, and work towards target
Chapter 2 – Value Stream	
Value Stream	<ul style="list-style-type: none"> ➤ The <i>value stream</i> is the set of actions required to satisfy a customer need <ul style="list-style-type: none"> • The <i>value stream</i> includes activities both within and external to the firm
How to Improve the Value Stream	<ul style="list-style-type: none"> ➤ Identify all steps in the process as one of three types of actions: <ul style="list-style-type: none"> • Steps that create value for the customer • Steps that don't create value, but are unavoidable in near term (<i>Type One Muda</i>) • Steps that don't create value, and are immediately avoidable (<i>Type Two Muda</i>) ➤ Work to eliminate the last two types of actions, since they are wasteful activities

Chapter 3 – Flow	
Flow	<ul style="list-style-type: none"> ➤ <i>Flow</i> is when product is continuously worked from raw material to finished good <ul style="list-style-type: none"> • Requires the elimination of ‘departmental’ and ‘batch-and-queue’ thinking
How to Establish Flow	<ul style="list-style-type: none"> ➤ Focus on the actual object (the design, part order, product, etc.) ➤ Ignore traditional boundaries (job, careers, functions, departments) ➤ Rethink specific work practices to eliminate backflows, scrap, stoppages ➤ Implement the above three steps together
Where to Establish Flow	<ul style="list-style-type: none"> ➤ <i>Design Phase</i> – cross-functional teams should use a Quality Functional Deployment (QFD) as the standard methodology to facilitate flow in the design process ➤ <i>Order Taking</i> – use takt time and visual controls to ensure production = sales ➤ <i>Production</i> – use heijunka, poke-yoke, jidoka, takt time, visual controls, 5 S’s ➤ Also consider where design and production should take place (in-house or outsource)
Kaizen (“Ongoing change for the better” in Japanese)	<ul style="list-style-type: none"> ➤ <i>Kaizen</i> is evolutionary change – continuous, incremental improvement ➤ <i>Kaizen</i> is a process involving a series of activities whereby <i>muda</i> is quickly eliminated by workers pooling ideas and increasing efficiency <ul style="list-style-type: none"> • Typically emphasizes manual work operations rather than equipment
Kaikaku	<ul style="list-style-type: none"> ➤ <i>Kaikaku</i> is revolutionary change, or radical improvement with out-of-the-box solutions that fundamentally change the way an activity is performed
Heijunka	<ul style="list-style-type: none"> ➤ <i>Heijunka</i> is smoothing variations in order flow unrelated to actual customer demand ➤ <i>Heijunka</i> is the process of level loading and sequencing the timing of production.
Jidoka	<ul style="list-style-type: none"> ➤ <i>Jidoka</i> is using automation with “human intelligence”, giving machines the ability to shut down automatically in the case of defects
Poke-Yoke	<ul style="list-style-type: none"> ➤ <i>Poke-Yoke</i> is mistake-proofing, or the use of fail-safe devices to prevent defects
Takt Time	<ul style="list-style-type: none"> ➤ <i>Takt time</i> is the rate of production needed to synch output with customer demand <ul style="list-style-type: none"> • $Takt\ Time = \text{Production Time} / \text{Required Production}$ (i.e. if the demand is 10 widgets per hour, then the takt time is 6 minutes per widget)
Continuous Flow Time (a.k.a. Touch Time)	<ul style="list-style-type: none"> ➤ <i>Continuous flow time</i> is the actual time needed to perform a process if it is worked continuously from start to finish (without interruption) – also referred to as <i>touch time</i>
Cycle Time	<ul style="list-style-type: none"> ➤ <i>Cycle time</i> is the total time required for a task to be complete. <ul style="list-style-type: none"> • Elements include processing time (<i>takt time</i>) as well as travel & queue time
Lead Time	<ul style="list-style-type: none"> ➤ <i>Lead time</i> is the total time to go from raw inventory to the finished product. ➤ ‘<i>Order to Remittance Lead Time</i>’ refers to the total time from when an order is placed until the finished product is shipped.
Visual Control	<ul style="list-style-type: none"> ➤ <i>Visual Control</i> is a method where all can tell at a glance if a process is in control <ul style="list-style-type: none"> • Andon Board – a status board that serves as a commo, discipline, & pacing tool.
5 S’s	<ul style="list-style-type: none"> ➤ The 5S’s are building blocks for shop floor discipline and control ➤ The 5S’s are five practices leading to a clean and manageable work area <ul style="list-style-type: none"> • <i>Seiri</i> (organization) – Sort • <i>Seiton</i> (orderliness) – Standardize • <i>Seiso</i> (purity) – Sweep • <i>Seiketsu</i> (cleanliness) – Simplify • <i>Shitsuke</i> (discipline) – Self Discipline

Chapter 4 – Pull	
Pull	<ul style="list-style-type: none"> ➤ <i>Pull</i> is a system in which each process withdraws the parts it needs from the preceding process when it needs them, in the exact amount needed. ➤ In its purest form, <i>pull</i> uses customer need as a signal to begin all upstream activities <ul style="list-style-type: none"> • Combats building an pushing unwanted goods/services (often thru discounts) • Customer demand becomes more stable in a pull system
Created Demand	<ul style="list-style-type: none"> ➤ <i>Created demand</i> is when part orders are made based on inaccurate forecasts, thus creating supply strains that are unrelated to actual customer demand
Chapter 5 – Perfection	
Perfection	<ul style="list-style-type: none"> ➤ <i>Perfection</i> is a realistic goal once the first four principles of lean thinking are in place <ul style="list-style-type: none"> • Transparency within the value chain ensures firms work towards adding value • Employee incentives are aligned with improvement • Perfection is pursued in relentless, repetitive kaizen events • Radical changes (<i>kaikaku</i>) make further improvements by reinventing processes
Policy Deployment	<ul style="list-style-type: none"> ➤ <i>Policy Deployment</i> is critical for successfully implementing lean thinking <ul style="list-style-type: none"> • Agree on a few simple goals for transitioning from mass to lean thinking • Select a few projects to achieve these goals • Designate the resources for getting projects done • Establish numerical improvement targets and a timetable

PART II – FROM LEAN THINKING TO ACTION

Chapter 6 – 10: Examples

Chapters 6 – 10 provide detailed examples of where ‘Lean Thinking’ principles have been successfully implemented in small and large companies, both domestically and internationally. The below summary only highlights key points.

<p>Chapter 6 The Simple Case (Lancaster Technologies)</p>	<ul style="list-style-type: none"> ➤ <u>Lancaster Technologies (Louisville, KY)</u> <ul style="list-style-type: none"> • Produces “stretch-wrapping” machines <ul style="list-style-type: none"> ▪ Stretches plastic around pallets vs. “shrink-wrapping” which melts plastic • Key Players – Pat Lancaster (Founder/CEO), Ron Hicks (Change Agent) ➤ <u>Chapter Highlights</u> <ul style="list-style-type: none"> • The company historically used ‘departmental’ and ‘batch-and-queue’ thinking <ul style="list-style-type: none"> ▪ <i>Production</i> – Mfg. made batches of 10-15 machines, but each customer bought only bought one: lead time was 16 weeks, but touch time was 3 days ▪ <i>Order Taking</i> – Departments processed each order in silos and expeditors ensured delivery: cycle time was 14 days, touch time was 2 days ▪ <i>Product Development</i> – 1 year for improvement, 3-4 years for new product • LanTech lost it’s patent protection and competition increased, creating a crisis <ul style="list-style-type: none"> ▪ The company tried several ideas to solve problems – reorganization, TQM, “Max-Flex” production (inventory), and MRP system – but nothing worked • Ron Hicks was hired to implement lean thinking techniques in Production <ul style="list-style-type: none"> ▪ <i>Kaikaku</i> – created production cells and established flow/pull ▪ <i>Kaizen</i> – implemented standard work, takt time, quick changeover • Pat Lancaster then focused on the Order Taking and Product Launch processes <ul style="list-style-type: none"> ▪ Established standard pricing and eliminated expediting and MRP scheduling ▪ Created dedicated, cross-functional product teams to launch new products
<p>Chapter 7 A Harder Case (Wiremold Company)</p>	<ul style="list-style-type: none"> ➤ <u>Wiremold Company (Hartford, CT)</u> <ul style="list-style-type: none"> • A global company making routing systems for power, voice, and data wiring, as well as other electrical equipment (i.e. surge protectors and line conditioners) • Key Players – Art Byrne (President, CEO, and Change Agent) ➤ <u>Chapter Highlights</u> <ul style="list-style-type: none"> • The lack of industry growth in Wiremold’s mature industry created problems <ul style="list-style-type: none"> ▪ The company tried several ideas to solve problems – acquisitions, TQM and JIT - but profitability still slipped • Art Byrne was hired to implement lean thinking techniques <ul style="list-style-type: none"> ▪ Downsized the company once, and guaranteed jobs to remaining employees ▪ Reorganized the company by product type ▪ Implemented kaizen events to improve production processes ▪ Established metrics and revised financial systems to support lean thinking ▪ Created a “lean” function with employees freed up by lean improvements ▪ Streamlined the product development and order-taking processes ▪ Linked employee compensation to profitability of the firm ▪ Created a growth strategy to employ resources freed up by lean thinking

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<p>Chapter 8 The Acid Test (Pratt & Whitney)</p>	<ul style="list-style-type: none"> ➤ <u>Pratt & Whitney (Hartford, CT)</u> <ul style="list-style-type: none"> • Produces aircraft engines • Key Players – Mark Coran (EVP for Operations), Bob D’Amore (Change Agent), Karl Krapek (Change Agent) ➤ <u>Chapter Highlights</u> <ul style="list-style-type: none"> • Pratt & Whitney evolved from a specialty machining company into a leading producer of highly engineered aircraft engines <ul style="list-style-type: none"> ▪ The company used classic “batch-and-queue” production and large, specialized machinery to create products • Deregulation of the U.S. airline industry, quality problems, Boeing’s redesign of the 737, and GEAE competition created business problems from Pratt in the 80’s <ul style="list-style-type: none"> ▪ The company tried several ideas to solve problems – including production, facility, and business unit reorganization – but profitability still slipped • Mark Coran was hired to implement lean thinking techniques at Pratt <ul style="list-style-type: none"> ▪ Bob D’Amore led initial kaizen events but ran into many roadblocks • Karl Krapek was brought in for additional support <ul style="list-style-type: none"> ▪ Reorganized Pratt by product ▪ Removed anchor draggers ▪ Replaced large, complex machines (‘monuments’) w/right sized equipment
<p>Chapter 9 Lean Thinking versus German Technik (Porsche Company)</p>	<ul style="list-style-type: none"> ➤ <u>Porsche Company (Stuttgart, Germany)</u> <ul style="list-style-type: none"> • Produces sports cars • Key Players – Wendelin Wiedeking (Ops Director →Chairman, Change Agent) ➤ <u>Chapter Highlights (Porche)</u> <ul style="list-style-type: none"> • Porsche’s evolved from a specialty engineering consulting firm for the auto industry to a maker of highly engineered, specialty sports cars <ul style="list-style-type: none"> ▪ Used a highly skilled workforce that essentially hand crafted each vehicle • Competition from Japan caused sales to drop, creating a crisis • Wendelin Wiedeking was brought in fixed Porche’s problems <ul style="list-style-type: none"> ▪ Brought in Japanese consultants to start kaizen, and overcame fierce resistance from proud workers & engineers ▪ Restructured the company to eliminate management layers ▪ Implemented a TQM-like quality system and solicited shop suggestions ▪ Created a “lean” function to drive improvements ▪ Once Porche was lean, the company exported ideas to suppliers ▪ Once the production system was lean, power shifted away from engineering to production – Wiedeking was promoted and fixed product development ➤ <u>Implementing Lean Thinking In Germany (Lean Thinking vs. German Tradition)</u> <ul style="list-style-type: none"> • German industry possesses many unique strengths <ul style="list-style-type: none"> ▪ A German firm’s financial support system emphasizes long term profitability ▪ Management focuses heavily on making a technically superior product ▪ Relations with suppliers are long term and supportive ▪ Workers at all levels have the highest skill levels in the world • German industry also has many weaknesses <ul style="list-style-type: none"> ▪ A very hierarchical structure makes communication difficult ▪ Germans like monster machines that produce in batches (‘monuments’) ▪ Often the ‘voice of the engineer’ is substituted for the ‘voice of the customer’, and unnecessary features are added that add no customer value • Competitive pressures create a need for Germany to adopt lean thinking <ul style="list-style-type: none"> ▪ Highly skilled workers often rework design and production problems downstream rather than fix the root cause – this cost cannot be sustained ▪ Superior performance features cannot continue to sustain higher margins ▪ Complex machine tools cannot continue to offset rising labor costs

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<p>Chapter 10 Mighty Toyota; Tiny Showa (Showa Manufacturing) (Toyota Company)</p>	<ul style="list-style-type: none"> ➤ <u>Showa Manufacturing (Japan)</u> <ul style="list-style-type: none"> • Produces large industrial products • Key Players – Tetuo Yamamoto (President), Taiichi Ohno (Change Agent) ➤ <u>Showa Highlights</u> <ul style="list-style-type: none"> • Demand for Showa’s industrial products slumped after the 2nd oil crisis in 1979 <ul style="list-style-type: none"> ▪ Showa relocated to a modern plant in an attempt to cut cost – w/o success • Taiichi Ohno was hired as a consultant to help fix Showa’s problems <ul style="list-style-type: none"> ▪ A kaikaku campaign changed batch processing to continuous flow • Tetuo Yamamoto completely revised Showa’s product offerings <ul style="list-style-type: none"> ▪ Showa’s traditional product line had no growth potential, so Yamamoto took advantage of lean company to transition to new product ➤ <u>Toyota Company (Japan)</u> <ul style="list-style-type: none"> • Produces large automobiles • Key Players – Sakichi Toyoda (Toyota Group Founder), Taiichi Ohno (Change Agent) ➤ <u>Toyota Highlights</u> <ul style="list-style-type: none"> • Sakichi Toyoda established lean concepts in production – automation and line stopping whenever a mistake was made to ID root cause & eliminate defects • Taiichi Ohno built upon these principles and institutionalized them <ul style="list-style-type: none"> ▪ Simplified operator tasks so that one person could man multiple machines ▪ Eliminated inventory with continuous flow and kanban system ▪ Created right-sized machines and implemented cellular manufacturing
<p>Chapter 11 – An Action Plan</p>	
<p><i>This chapter provides an action plan & timeline for implementing lean thinking within an organization.</i></p>	
<p>Getting Started (First 6 months)</p>	<ul style="list-style-type: none"> ➤ <i>Find a Change Agent</i> – identify an internal or external employee w/correct mindset ➤ <i>Get Lean Knowledge</i> – lean knowledge is not needed at outset, but learn ➤ <i>Find a Crisis</i> – a crisis (real or created) is ideal to help drive change ➤ <i>Map Value Streams</i> – map both physical and information flows ➤ <i>Begin Kaikaku</i> – pick a problem area, do something immediately, achieve results ➤ <i>Expand Your Scope</i> – achieve dramatic/visible results, and use momentum
<p>Create a New Organization (6 months – Year 2)</p>	<ul style="list-style-type: none"> ➤ <i>Reorganize by Product Family</i> – organizations should focus on creating value ➤ <i>Create a Lean Function</i> – best bet is to combine quality department w/change agent ➤ <i>Develop Policy for Excess People</i> – don’t lay-off people because of lean improvement ➤ <i>Develop Growth Strategy</i> – use excess people (from above) to grow the business ➤ <i>Remove Anchor-Draggers</i> – if managers and employees don’t change, remove them ➤ <i>Instill “Perfection” Mindset</i> – continually refine improvements with multiple kaizen
<p>Install Business Systems (Year 3 – 4)</p>	<ul style="list-style-type: none"> ➤ <i>Initiate Policy Deployment</i> – use “just do it” to get lean thinking started, but once things are moving you need policy changes to make the lean approach self-sustaining ➤ <i>Introduce Lean Accounting</i> – Activity Based Costing is ok, but lean thinking allows you to more accurately use direct product costing ➤ <i>Tie Pay to Firm Performance</i> – pay market wages with a hefty bonus if firm succeeds ➤ <i>Implement Transparency</i> – continually measure and benchmark internal performance ➤ <i>Introduce Lean Learning</i> – establish a training program that maximizes benefits ➤ <i>Find Right Sized Tools</i> – rethink your machinery and modify/eliminate ‘monuments’
<p>Complete the Transformation (Year 5)</p>	<ul style="list-style-type: none"> ➤ <i>Involve Suppliers/Customers</i> – help fix supplier/customer issues and share the savings ➤ <i>Develop Global Strategy</i> – implement lean thinking to support each global market ➤ <i>Transition to Bottom-up</i> – lean thinking may start top-down, but shift to bottom-up

PART III – FROM LEAN THINKING TO ACTION***Chapter 12: A Channel for the Stream; a Valley for the Channel***

This chapter defines and expands upon the concept of implementing a lean enterprise.

Lean Enterprise	<ul style="list-style-type: none"> ➤ A <i>lean enterprise</i> is a continuing conference of all concerned firms to create value <ul style="list-style-type: none"> • Customer value is only maximized when firms implement lean thinking together • Requires transparency in the activities of the company, suppliers, and customers
Industrial ‘Cold War’	<ul style="list-style-type: none"> ➤ Firms typically work to maximize value to the customer in terms of what they provide, but fail to maximize the value chain for the customer <ul style="list-style-type: none"> • For example, in the travel industry the airline, taxi, hotel, rental car, tour firms each maximize their own value w/o maximizing travel system for customer ➤ A cold war exists since firms never really work together - each try to grab a bigger piece of the pie instead of maximizing the industry value chain for the customer ➤ Firms in the same value stream should negotiate principles for joint behavior <ul style="list-style-type: none"> • Define value jointly, and establish target costs for the value stream product • All firms must make an adequate return based upon what customer will pay • Firms must work together to identify & eliminate muda in value stream • Every firm has the right to examine any other activity in the value stream
Alternating Careers	<ul style="list-style-type: none"> ➤ Career progression should be between cross-functional team roles and functional roles <ul style="list-style-type: none"> • Lean thinking emphasizes cross-functional teams that are aligned by product • Functional departments will have a diminished role in a lean enterprise, but will systematize current knowledge, teach it others, and search for new knowledge
Cultural Challenges to the Lean Enterprise	<ul style="list-style-type: none"> ➤ American Challenges – overcome the “every firm for itself” mentality ➤ German Challenges – overcome reluctance to work in horizontal work teams ➤ Japanese Challenges – overcome issues with vertical functions and globalization

Chapter 13 – Dreaming About Perfection

This chapter provides examples of what a lean enterprise might achieve in different value streams.

Long Distance Travel	<ul style="list-style-type: none"> ➤ <u>Current Problems</u> <ul style="list-style-type: none"> • Airline travel is “batch-and-queue” – customers “batched” at hubs and “queued” to wait for connecting flights • The customer values speed, low-cost, simplicity ➤ <u>Lean Thinking Solutions</u> <ul style="list-style-type: none"> • Direct flights between small cities, eliminate check in and baggage handling by having customers report directly to flight, use smaller airports with less overhead
Medical Care	<ul style="list-style-type: none"> ➤ <u>Current Problems</u> <ul style="list-style-type: none"> • Medical treatment is “batch-and-queue” – patients are referred to and wait for specialists and are sent to centralized locations for lab & equipment testing • The customer values fast, low-cost, and quality medical care ➤ <u>Lean Thinking Solutions</u> <ul style="list-style-type: none"> • Multi-skilled, cross-functional medical teams and right-sized medical equipment
Food Production & Distribution	<ul style="list-style-type: none"> ➤ <u>Current Problems</u> <ul style="list-style-type: none"> • Supermarkets have expensive inventories and customers waste time shopping • The customer values fast and low-cost grocery shopping ➤ <u>Lean Thinking Solutions</u> <ul style="list-style-type: none"> • Daily replenishment of supermarkets based on yesterday’s sales, elimination of warehouses, and planned delivery to customers based on a standard grocery order

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Construction	<p>➤ <u>Current Problems</u></p> <ul style="list-style-type: none">• Office and house construction takes too long, requiring too much inventory & rework, and the finished product typically has unfinished work/quality problems• The customer values speed, low-cost, and quality construction <p>➤ <u>Lean Thinking Solutions</u></p> <ul style="list-style-type: none">• Better communication between buyers, builders, and contractors would allow precise orders thru value specification• Flow production would allow house to be built in 1 week after order w/factory-made components• Reduced inventory and rework would cut costs
Short Range Personal Mobility	<p>➤ <u>Current Problems</u></p> <ul style="list-style-type: none">• The auto industry is inefficient at providing optimal personal mobility, and requires customer time to find insurance, maintenance, fueling, and cleaning• Customer wants low cost transportation without hassle <p>➤ <u>Lean Thinking Solutions</u></p> <ul style="list-style-type: none">• A company that provides a car with insurance, maintenance, fueling, cleaning, and replacement vehicles to a customer, while allowing transparent pricing• The company benefits from predictable demand flows, reduction of dealership inventory, volume discounts, and better recycling of used vehicles