Society of Manufacturing Engineers Toronto
Advancing Manufacturing in Ontario

LEAN-ing Toward Success…

A 6 Step Approach…..

…to Improve the Operation of a Business.

Nigel Southway, C.Eng. MSc. BIM . Author.

Chair 2012 Society of Manufacturing Engineers Toronto Chapter

Society of Manufacturing Engineers

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Advancing Manufacturing in Ontario

About SME:

MEET KNOW GROW

The Society of Manufacturing Engineers

Premier source for manufacturing knowledge, education and networking.

Many programs, events, magazines, publications and online training division, (Tooling U),

Connects manufacturing practitioners to each other,

Reviews latest technologies and most up-to-date manufacturing processes.

SME has members around the world supported by a network of chapters and technical communities.

SME is a leader in manufacturing workforce development issues, working with industry, academic and government partners to support the current and future skilled workforce.

www.sme.org.

$125 per Year

SME LEAN Certification

Society of Manufacturing Engineers

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Lean Certification

- Lean Certification
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- Lean Silver Certification
- Lean Gold Certification
- Lean Certification Pricing
- Preparing for Certification
- Classroom Review Program for Lean Certification
- Lean Online Review Program (LORP)
- Lean Certification: Recertification Requirements
- Lean International Reseller
- Certification Oversight & Appeals Committee
- Professional Development
- SME Certification
- Green Manufacturing Specialist Certificate
- EET Outcome Assessments for Educators
- Lean Registry
- SME Certification Frequently Asked Questions (FAQ)

Manufacturing Knowledge Resource

Lean Certification

This Lean program is the benchmark for achievements and personal growth in Lean.
Designed by three organizations – the Society of Manufacturing Engineers (SME), the Association for Manufacturing Excellence (AME) and The Shingo Prize for Operational Excellence – this alliance has established the standard for continuous improvement and Lean practices.

In 2010, the American Society for Quality (ASQ) joined this collaborative alliance, which truly aligns these leading organizations to a single standard for Lean certification, providing manufacturers and their supply chains with a roadmap for workforce development.

AME®

ASQ®
The Global Voice of Quality™

THE SHINGO PRIZE
for OPERATIONAL EXCELLENCE

LEAN CERTIFICATION

Society of Manufacturing Engineers

LEAN-ing Toward Success…

……. A 6 Step Approach to Improving the Operation of a Business.

Learn how to approach the implementation of LEAN to eliminate business waste.

An introduction to the LEAN toolkit

How to move toward the SME LEAN certification process.

Why LEAN thinking will become a survival tactic and a prerequisite for us all.

The **Take Back Manufacturing** initiative to rebuild our manufacturing economy in Canada.

LEAN implementation is a prerequisite to be entitled to **Take Back Manufacturing**

Bonus: Receive a positional paper on the subject

Access the SME Toronto survey..…… LEAN self analysis online for members

Nigel Southway, C.Eng. MSc. BIM . Author. CYCLE TIME MANAGEMENT …*Fast Track to Productivity Improvement*

Chair 2012 Society of Manufacturing Engineers Toronto Chapter

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Society of Manufacturing Engineers

NEXUS

CONSULTING SERVICE

LEAN

NEXUS

Who is here?

- Who has never heard of LEAN before?
- Who have never taken a LEAN class
- Who has implemented LEAN
- Who is an advanced LEAN User

NEXUS

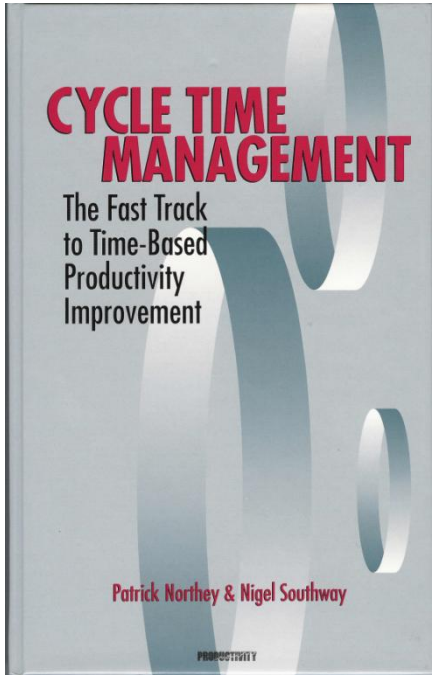
NIGEL SOUTHWAY

Owner of NEXUS CONSULTING SERVICE

AUTHOR : **CYCLE TIME MANAGEMENT**
…… ***Fast Track to Productivity Improvement***

- **40 years** Broad Business and Manufacturing Experience

- **Rough post-war Sea-Port (Bristol England)**
- **Posh name/Specs…Stress/had to grow up tough**
- **Product of the British Swinging 60's !!!!!**
- **British Engineering Apprentice…Aerospace/Electronics**
- **BSc EEE C-Eng. in Engineering/MSc Management … Manufacturing Eng (1972)**
- **MOTOROLA Director Manufacturing Eng / Lean and Six Sigma Implementation**
- **Change Agent/Educator/Coach/Advisor for LEAN business improvement**
- **Consulted many organizations in different industry sectors**
- **Have assisted many Global Sourcing programs and Joint Ventures**
- **Society of Manufacturing Engineers …2012 Chair Toronto chapter**



- **Globalized Manufacturing will remain a significant challenge!!**
- **Strong Coach to Vision and Plan a Balanced Source Evolution !**

www.nigelsouthway

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The Birth Of LEAN

The 1980s was a Renaissance period for Manufacturing and Engineering

Many believe this was created by the Space Race!!!

Others believed it was due to the next generation of younger management

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1970 1980 1985 1990 1995

BUSINESS SYSTEMS

MRP (Materials Resource planning)

CIM

Pull systems

MRP 2 (Manufacturing Resource Planning)

ERP (Enterprise Requirements Planning

MANUFACTURING

W E Deming → **JIT** QDC

SPC

Theory of constraints(The GOAL)

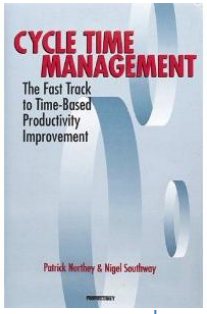
Cycle Time Management

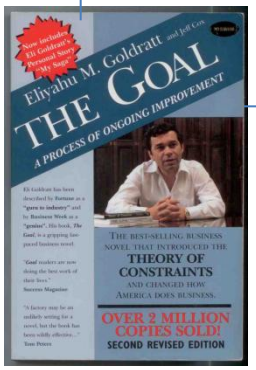
Kaizan

TPM

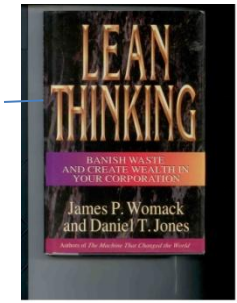
Problem Solving/8D/5Y

DOE (Design Of Experiments)





LEAN THINKING



NEW PRODUCT INTRODUCTION

Product teams

Simultaneous engineering

Phase Review process

DFM

Six Sigma

(Motorola)

QS9000/APQP

Problem solving 8D /5Y /4 phase etc

CULTURE CHANGE

Participative management style

Teamwork power

People Empowerment

Pay for skills/Gain sharing

TOYOTA PRODUCTION SYSTEM **Visual factory**

5S

Supplier partnering

MEASUREMENTS

Value Engineering → ABC (Activity based Costing)

Pyramid/Balanced Scorecard

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The Birth Of LEAN

Reading list

- The JIT threat… "Made in Japan" — Early 80s… TPS etc
- The GOAL… — 1984 Goldratt
- TOTAL CYCLE TIME — 1985 Phil Thomas
- World Class Manufacturing — 1986 Schonberger
- Cycle Time Management — 1993 Northey/Southway
- Lean thinking — 1996 Womak/Jones

- Many LEAN Educational packages…….
- LEAN/Six Sigma Certification programs……

- **SME** LEAN Benchmarking Workshop series…….

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INDUSTRY WEEK

THE CYCLE-TIME ADVANTAGE

An integrated approach delivers the greatest competitive impact, contend the authors of a new book on managing the total business cycle.

By Patrick Northey and Nigel Southway

GLOBAL COMPETITIVENESS IS FORCING COMPANIES OF ALL sizes to go to ever-greater lengths to improve customer satisfaction. If they focus on cycle time as their productivity measure, they can both decrease delivery time and improve quality, obviously creating a more satisfied customer. A company's total business-cycle time is measured from the time a customer's need is identified to receipt of payment from that customer for the finished product. The best analogy is a relay race. The time begins with the starting gun and ends when the last runner breaks the tape at the finish line. It includes all the time required to run each leg, as well as the time required to transfer the baton at the end of each leg. Total business-cycle time includes any or all of the following subcycles or loops:

The make/ship loop. The time from receipt of material, through the value-adding conversion steps, to shipment or transfer of a finished product to the distribution loop.

The distribution loop. The time from finished production to shipment to the customer from the distribution warehouse.

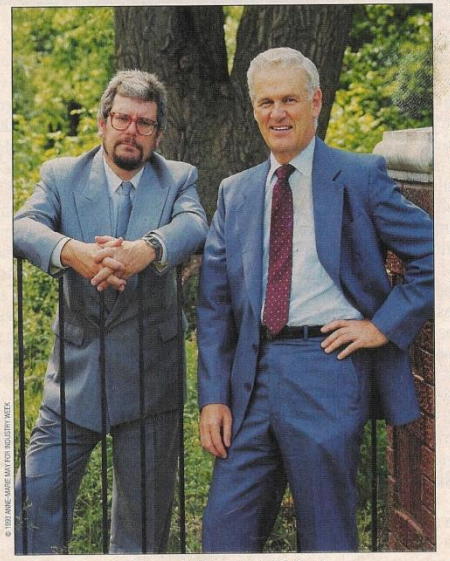
The supply loop. The time from release of the purchase order to receipt of the correct materials in the right quantities at the right point in the manufacturing process.

The new-product-introduction loop. The time from identification of the need for a new product to delivery of the first unit of product to a customer.

The strategic-business-development loop. The time required to develop a new strategy, make the decision to adopt it, and then implement it.

In the last decade, it has become clear that the compartmentalization of these loops has inhibited competitiveness. All the loops must be integrated if total business-cycle time is to be reduced. In the 1980s most companies trying to make improvements focused on the make/ship loop. Prior to 1980 a long backlog of orders in this loop created a sense of complacency. This complacency rippled through the distribution and supply loops as well. As long as customers tolerated the long wait, the system worked, because it enabled the manufacturing process to "minimize product cost" by using "economical" batch sizes. This approach increased the total cycle time, but time was not perceived as a critical issue. When customers started demanding shorter delivery times and were able to get them from competitors, a problem arose. Sales departments responded to this competition in the following ways:

- *They persuaded manufacturing to commit to unrealistic delivery times.* As a result, sales departments soon discovered that they were constantly having to break promises to customers; to keep customers happy, they had to become internal expeditors, which increased the tension with manufacturing.
- *They increased factory orders for finished goods and distribution inventory.* This increase put even more pressure on manufacturing, and the ensuing loss of trust led to second-guessing between marketing and manufacturing. In addition, the already uncertain sales forecast used to order material supplies had to be made even further in advance, since the suppliers were caught in the same time squeeze. As the forecast period was extended, the potential for error and disagreement increased.



Authors Nigel Southway (left) and Patrick Northey

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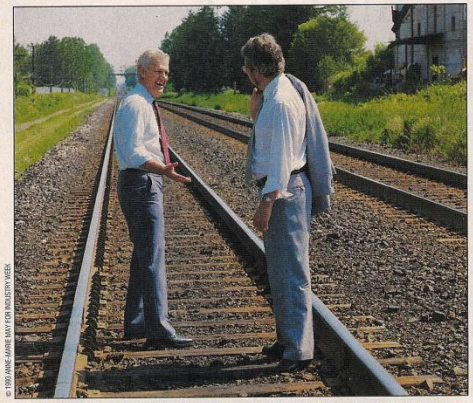
A double problem arose for those organizations whose competitors *could* deliver the correct product in a measurably shorter cycle time. The lower cycle time meant that these competitors could produce at lower cost and did not require such large inventories, which further reduced their costs. Not only were the slower companies struggling to compete, but they were faced with margin problems caused by the higher costs of inventory and waste in the structure.

The reaction of some manufacturers was to reduce their inventories. For a while the "slimming pill" worked. But as competitors with shorter cycle times continued to steal market share, it became obvious that to survive companies would have to do things differently, not just do them harder.

The next villain manufacturers focused on was the excessive time required by the manufacturing cycle. To reduce cycle time, many companies initially relied on new technology. Although technology has a role in the new cycle-time-focused approach, it is an expensive and often ineffective way to start. The reality is that as many as 90% of the existing activities are nonessential and can be eliminated. As soon as manufacturers focused on processes, they could see the waste associated with changeovers, quality defects, process control, factory layout, machine downtime, and scheduling. They soon realized they could dramatically reduce the make/ship-loop cycle time.



Patrick Northey and Nigel Southway: "The corporations that can eliminate red tape and minimize the time required to make and execute decisions will be able to survive in the 1990s."

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AS THE MANUFACTURING CYCLE TIME started to decrease, it became apparent that the cycle time for processing a customer's purchase order was greater than the time it took to manufacture the product. This was not surprising because in the traditional environment of long manufacturing cycle time there is no incentive to rush the customer-order paperwork through. It will only sit in the queue until manufacturing is ready for it. While reducing the cycle time in the make/ship loop is the logical place to start, reducing this loop's cycle time in isolation will not be enough to satisfy customer demands for better quality products, delivered more quickly. Once you reduce cycle time in the make/ship loop, the activities in the other traditional loops become the next focus for improvement.

The complexities associated with the distribution loop vary from business to business. The issue, however, is not how many hands the order goes through, but what essential role these hands play in the process and how long the process takes. For example, distributors may not be providing timely sales information because they are using the order-point method of signaling their needs. This can delay arrival of the information to the manufacturing process for several days. Some companies have taken advantage of computer networking systems to provide sales-order information on a daily basis.

Although the supply loop is a significant contributor to the total business cycle time, most companies are powerless to force suppliers to reduce their cycle times. Only large companies, such as the automotive giants, have had enough clout to insist that their material be delivered "just-in-time." Until suppliers develop their own programs for reducing internal cycle time, the objective for most companies will be to ensure the stability of material deliveries by encouraging the supplier's efforts to improve quality.

To succeed in the 1990s, many corporations will have to dramatically reduce their new-product-introduction time. As product life cycles continue to decrease, the key to success will be to integrate 1. new-product strategies; 2. new-product research; 3. product development; and 4. launch activities into one effective short-cycle capability that can respond consistently to ever-increasing market demands. To minimize the new-product-introduction cycle time requires an organization that has already minimized cycle times in the other loops and is able to integrate them with this loop.

The strategic-business-development loop is probably the most poorly managed of all loops. This is not because the people involved lack skill or intelligence, but because they do not fully understand the high financial returns to be gained from improving the loop's cycle time. Many books and articles have been written on the correct way to manage this loop. Some even hint at how to improve the cycle time. But few (if any) expose this loop as the prime mover for total business improvement. Rarely is the overall business-cycle time labeled as either an area for improvement or a parameter to be coordinated through the strategic-business-development process.

Too often, this loop is encumbered by size, politics, economics, and legal and financial inertia. The corporations that can eliminate red tape and minimize the time required to make and execute decisions will be able to survive in the 1990s. Those that cannot meet those demands will not make it into the next century. Unfortunately, many companies have not even started to reduce their total business-cycle times. The result is that not only are they denied short new-product-development and strategic-planning cycle times, but they are failing to meet rising customer expectations for shorter delivery times, higher quality, and wider product variety. The only way to keep up is to integrate the supply, make/ship, and distribution loops into one short-cycle-time manufacturing loop—and then integrate that with the new-product-development and strategic-planning loops.

A short strategic-planning loop ensures that all five loops will be integrated and embeds continuous cycle-time reduction into the corporate culture. ◄

Patrick Northey is president of Interaction Ltd., a change-management consulting firm, and was a founding partner of Cycle Time Management Inc., Mississauga, Ont. Nigel Southway is a consultant with Cycle Time Management Inc. This article was adapted from their new book, Cycle Time Management: The Fast Track to Time-Based Productivity Improvement *(Productivity Press, Portland, Oreg.)*

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Royal Canadian Mint,

BFL,
British Airways,
BTR,
Tectrol,
Tiercon,
ACS,
Imperial Rubber,
GTD,
VERTIGO,
Canadian Pools,
Telephoto
SXA
GlaxoSmithKline.

Baxter,
Ciba Corning,
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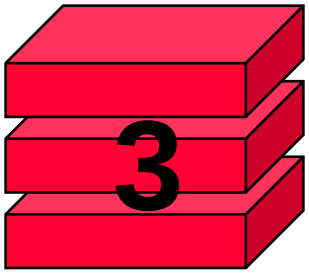
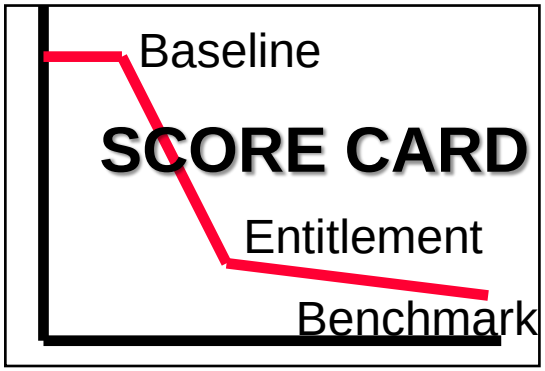
NEXUS

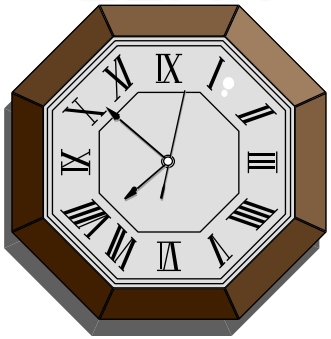
5 CYCLE-TIME Loops in a business



3 TIERS for Change

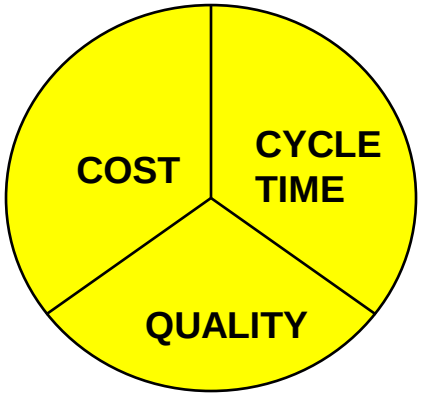


LEAN



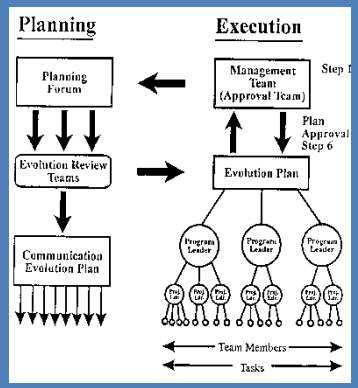
CYCLE TIME

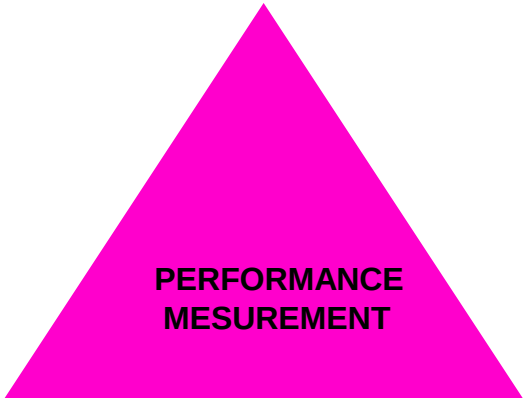
Continuous

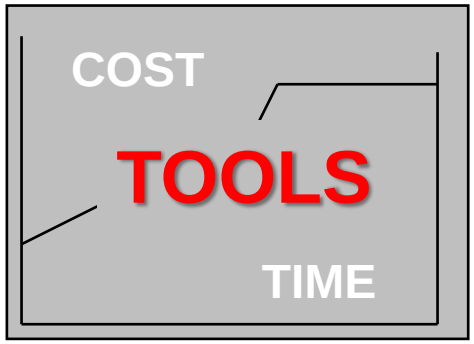


Improvement

IMPLEMENTATION







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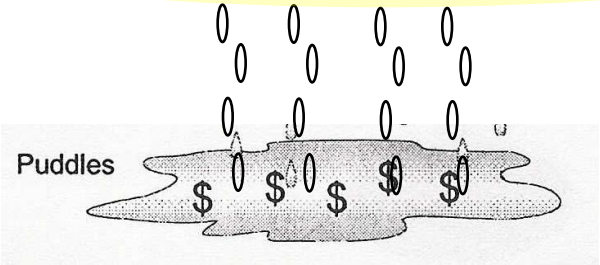
Need to improve ???

Lets get organized!!!!

NEXUS

Busy having a bad day?

- Too busy to fix it.. Running the business or the department
- The accountant shows the drips and puddles..



NEXUS

Busy having a bad day?

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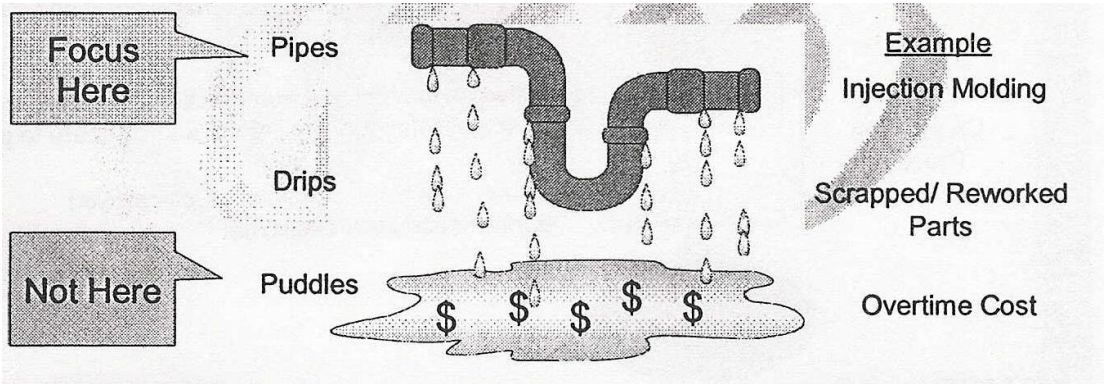
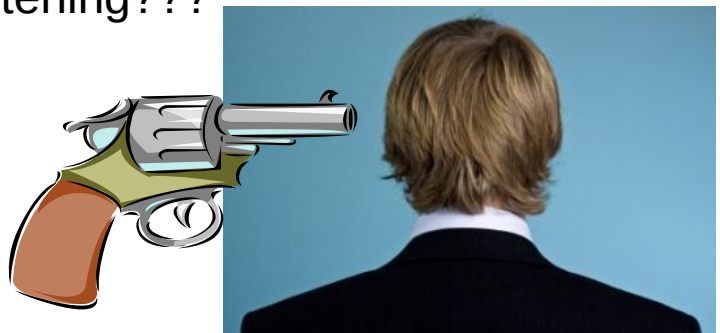


- But who will find and fix the leaks?
  - Pass the waste as a cost increase to customer ?
  - Try to trade it for better quality and delivery?
  - Budget belt tightening???

Or….



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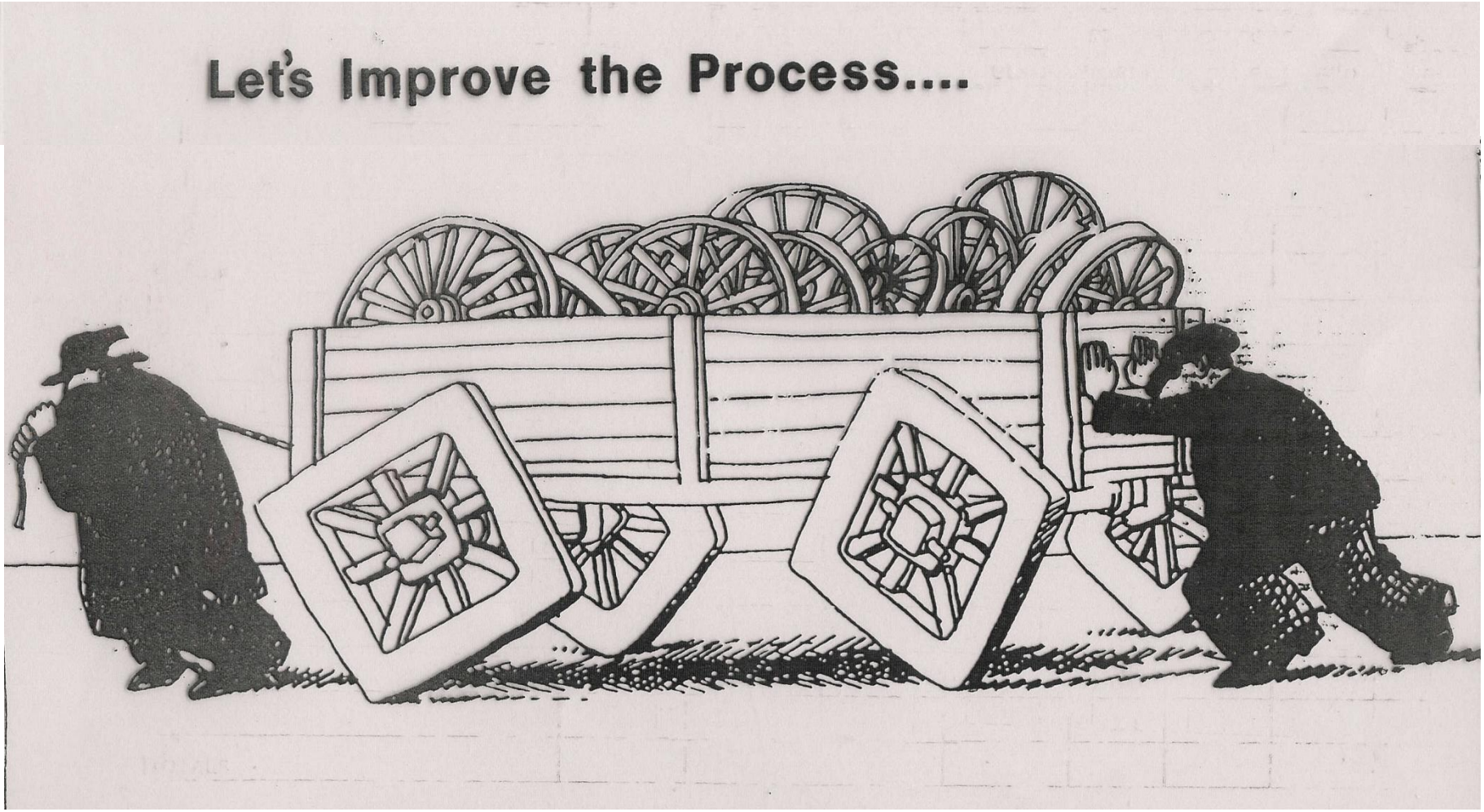


"In any business big or small and whatever the type of Products or services as much as 90% waste or non value adding cost can exist in some of the activities within the business"

NEXUS

The Good News!!

- **Get fit Tools exist to attack waste!**
- Waste can be removed from Quality/Delivery/Cost.
- Seek out and eliminate/reduce …by doing things differently!
- Move cash to the bottom line.. Make MONEY

- **They are called LEAN thinking tools**

- **Attack that waste… but you must get organized…**

NEXUS

LEAN-ing Toward Success…

The 6 Step Approach

1/ Get Help/Learn the tools

2/ Develop your vision

3/ Build your Evolution plan

4/ Start making changes via projects

5/ Get some successes

6/ And keep it going

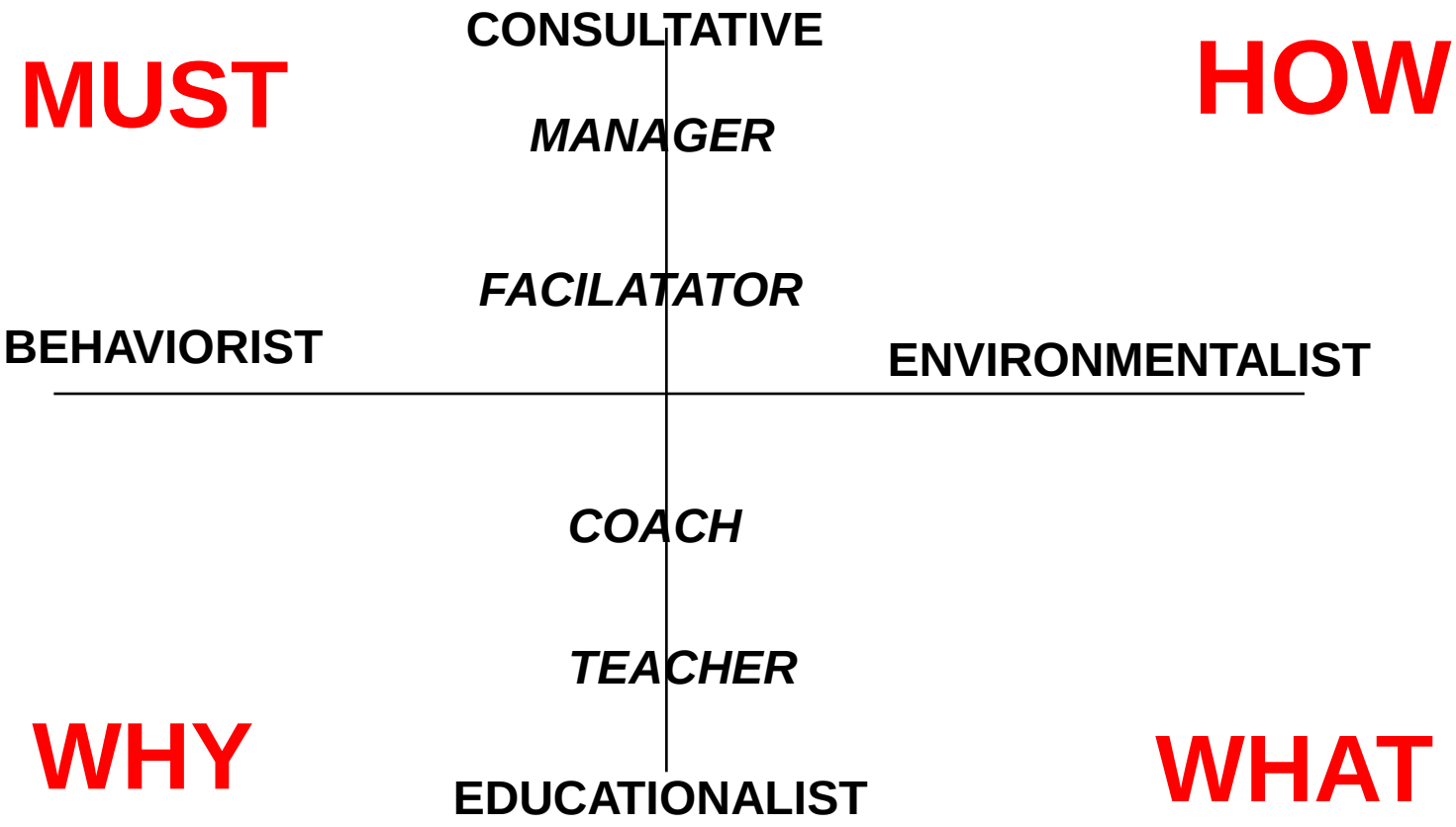
NEXUS

Get Help/Learn the tools

- Pick a coach/educator/helper
- Ensure they have an implementation process
- Make sure they will not let go till its done
- Avoid
  - Large guys
  - Cut slash and burners
  - Capital solution sellers
  - Ensure its simple and understood
  - Avoid the magic pill
  - Pick some-one with something that fits your organization
- Appoint your own internal Change Agent / Coordinator

NEXUS

CHANGE COORDINATION STYLES



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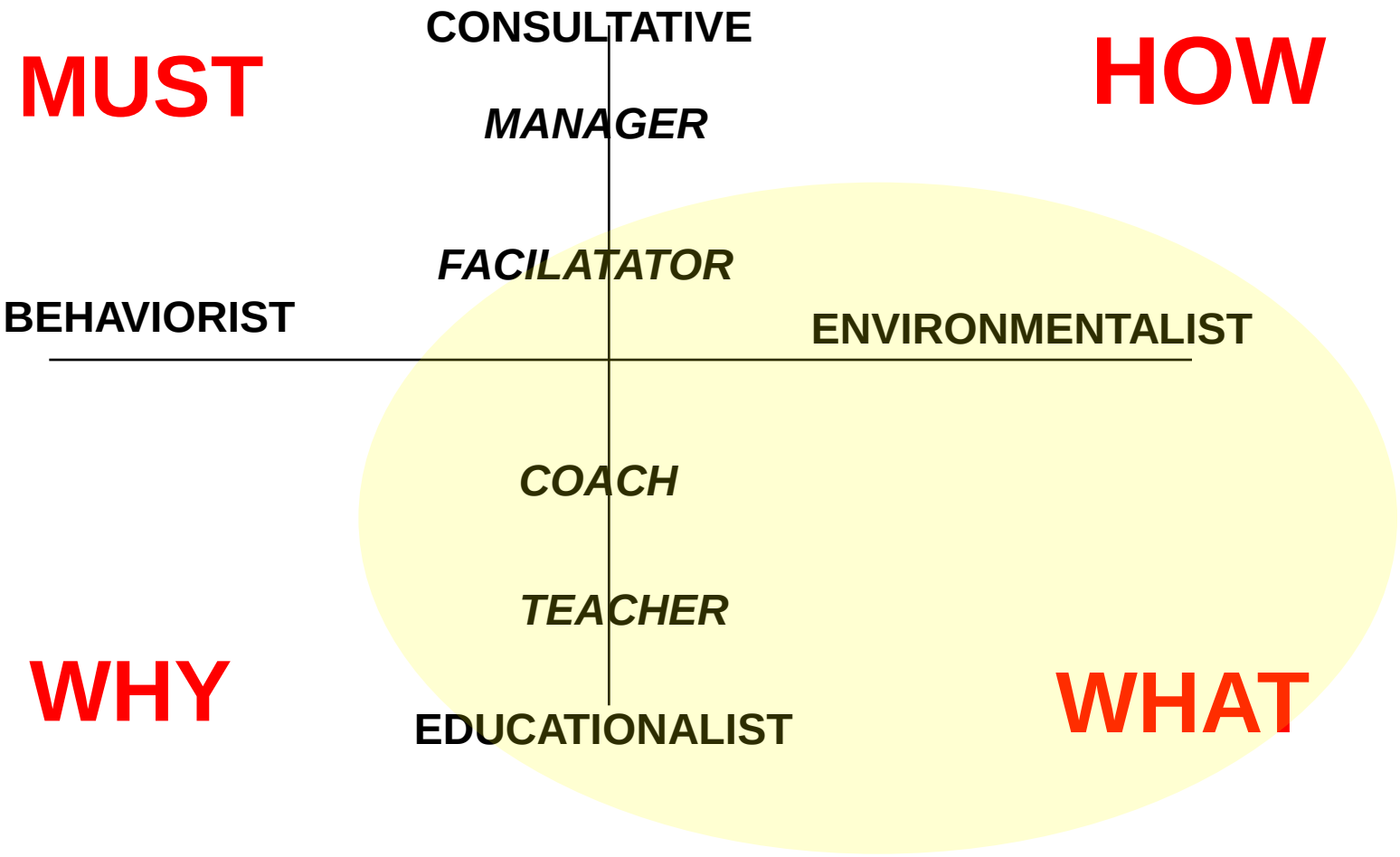
CHANGE COORDINATION STYLES



REMEMBER…….
YOU CAN CHANGE THE ENVIRONMENT EASIER THAN THE PEOPLE

THE TOOLS

LEAN THINKING

&

CYCLE-TIME REDUCTION

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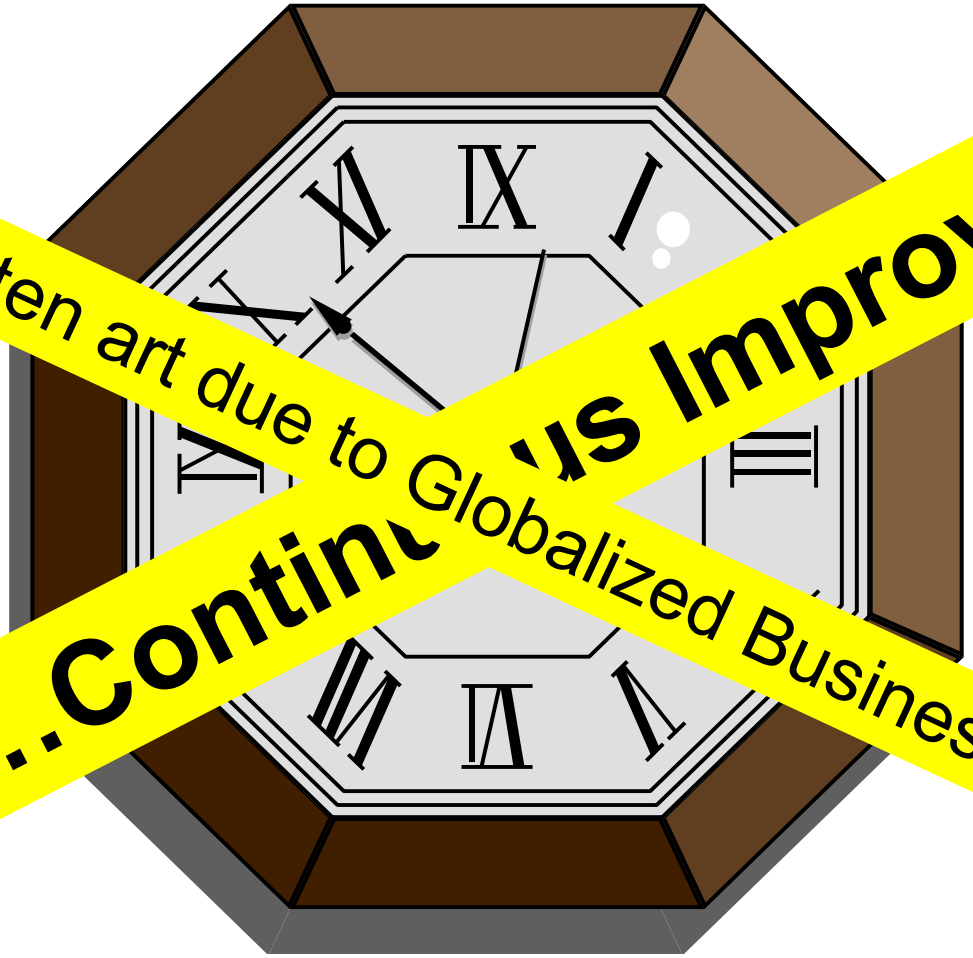
CYCLE-TIME



The forgotten art due to Globalized Business Activity

Create…Continuous Improvement

LEAN- THINKING **NEXUS**

Clients where I have applied CYCLE TIME reduction (LEAN THINKING)

- Electronic assembly
- Meat processing plant..
- Metal fabrications
- HVAC Manufacturing
- Toothpaste manufacturing
- Steel mill processes
- Bank check clearing house
- US army medical Corp
- Whiskey distilling
- Dry-cell battery production
- Credit card emboss house
- Electrical products
- Custom Power-Supplies
- Computer design/manufacture
- Sheet-metal fabricators
- Plastic injection molding
- Truck Components supplier
- Construction equipment
- Oil industry equipment providers
- Aerospace equipment providers
- Soap factory
- Bubblegum and candy factory
- Food additive producer
- Data-com system provider
- Computer software developer
- Royal Canadian Mint (Coins and Medals)
- Security equipment
- Off-road equipment
- Water pipeline manufacturer
- Exhaust System Manufacturing
- Commercial swimming pool manufacturing
- Auto dealerships
- Medical equipment Design/Manufacturer
- Oil extraction equipment manufactures
- Nano-tech li Battery Manufacturing
- Automotive parts supplier

Comments that can make you go insane!!!!

1. We tried that before.
2. Our place is different.
3. It costs too much.
4. That's beyond our responsibility.
5. That's not my job.
6. We're all too busy to do that.
7. It's too radical a change.
8. We don't have the time.
9. Not enough help.
10. That will make other equipment obsolete.
11. Let's make a market research test of it.
12. Our division is too small for it.
13. Not practical for operating people.
14. The men will never buy it.
15. The union will scream.
16. We've never done it before.
17. It's against company policy.
18. Runs up our overhead.
19. We don't have the authority.
20. We tried that back in '62.
21. Let's get back to reality.
22. That's not our problem.
23. Why change it, it's still working o.k.
24. I don't like the idea.
25. You're right, but...
26. You're two years ahead of your time.
27. We're not ready for that.
28. We don't have the money, equipment, personnel, room, etc..
29. It isn't in the budget.
30. Can't teach an old dog new tricks.
31. Good thought, but impractical.
32. Let's hold it in abeyance.
33. Let's give it more thought.
34. Top management would never go for it.
35. Let's put it in writing.
36. We'll be the laughing stock.
37. Not that again.
38. We'd lose money in the long run.
39. Where'd you dig that one up?
40. We did alright without it.
41. We don't have the staff.
42. It's never been tried before.
43. Let's shelve it for the time being.
44. Let's form a committee.
45. Has anyone else tried it?
46. Customers won't like it.
47. I don't see the connection.
48. It won't work in our plant.
49. What you are really saying is...
50. Maybe that will work in your department, but not mine.
51. The management committee will never go for it.
52. Don't you think we should look into it further before we act?
53. What do they do in our competitor's plant?
54. Let's all sleep on it.
55. It can't be done.
56. It's too much trouble to change.
57. It won't pay for itself.
58. I know a fellow who tried it.
59. It's impossible.
60. **We have always done it this way!**

NEXUS

Definition:

INSANITY

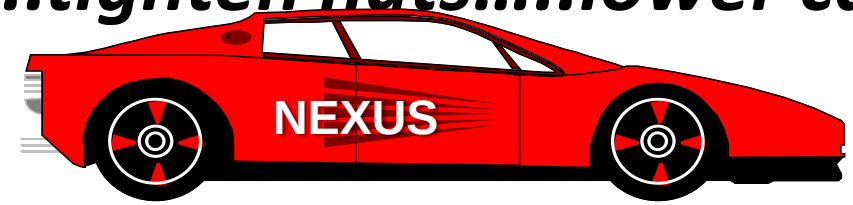
"Doing the same things…. and expecting better results!"

NEXUS

A WASTE REDUCTION EXAMPLE!!!

- How long does it take you to change a wheel on your Car????
- **15 minutes??** or even longer??..to do the following essential activities….

Stop car…..raise car…..remove nuts….replace new wheel…..tighten nuts…..lower car…..Go…



- ***AN INDY PIT CREW DOES THE SAME PROCESS IN ….***

…….LESS THAN 10 SECONDS!!!!!!

NEXUS

The things in daily life that are WASTE…..

Business commute time and effort

Airport check in and baggage handling

Hotel check-in

Waitress/food prep service

Security at airports

Most Service wait time

Global trade and regional distribution

Too many different languages

Different currencies

Legal system and agreements

Un-employment insurance

Government non capital spending

Immigration and migration burden

Paper file systems

Push Marketing & Advertizing

Some democratic Processes

Complex taxation systems

Etc etc etc etc

NEXUS

What is Total Business Cycle Time?

“Total Cycle Time” is the actual time elapsed from when a customer expresses a need for that product or service until the time the customer's need is satisfied and payment is received.

NEXUS

Cycle Time Is The Time It Takes To Get Something Done!!!

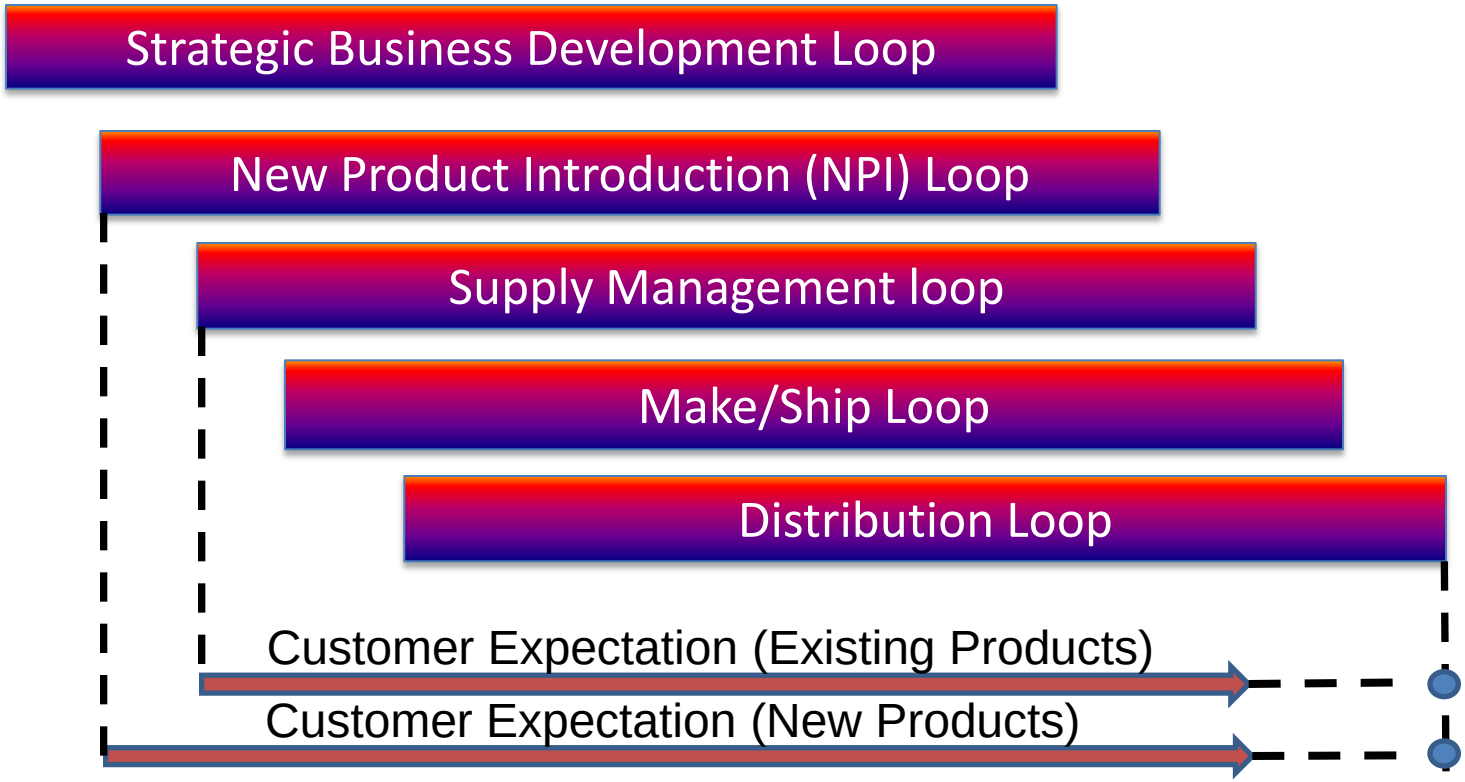
- Improve quality
- Deliver a service
- Develop a product
- Enter an order
- Design a product
- Manufacture a product
- Develop a financial plan

- Close the books
- Reduce inventory
- Procure materials
- Develop a spec
- Type a letter
- Develop a proposal
- Change culture ….

(i.e.. change the way to do business)

NEXUS

The 5 Cycle Time Loops in any Business



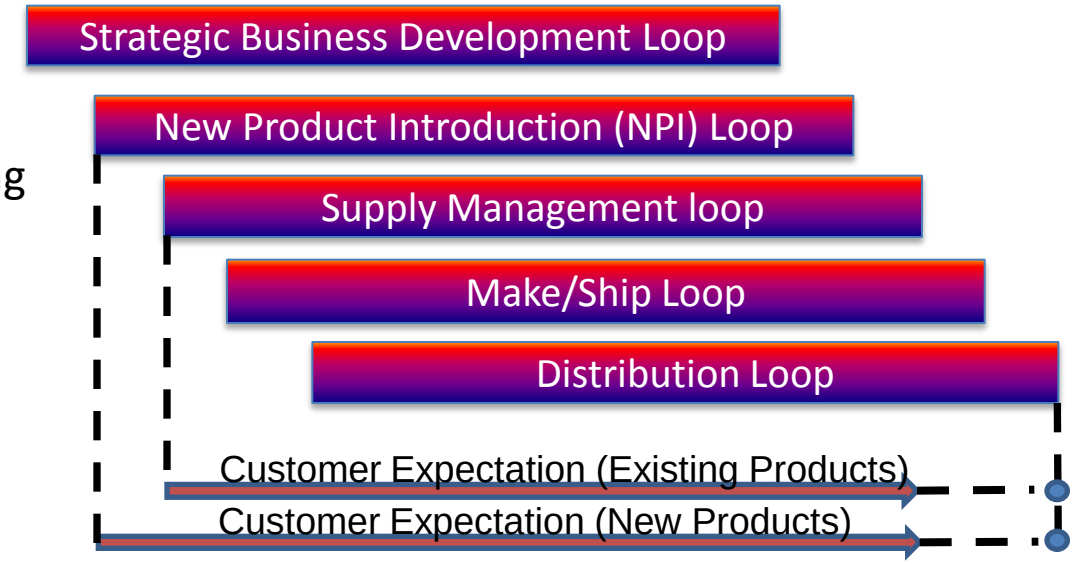
"Total Cycle Time" …The actual time elapsed from when a customer expresses a need for that product or service, until the time the customer's need is satisfied, and payment is received.

NEXUS

The 5 Cycle Time Loops in any Business

- Who is the customer?
- Must think holistically !
- From Vertical to Horizontal thinking
- The 5 Loops in the business
- Use the 5 Loops to provide focus

5 Business Loops



"Total Cycle Time" …The actual time elapsed from when a customer expresses a need for that product or service, until the time the customer's need is satisfied, and payment is received.

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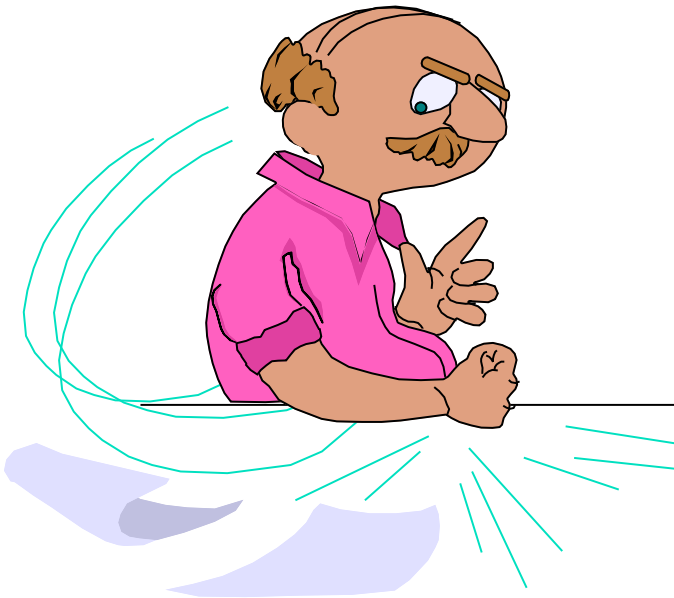
Supplier/Customer Relationship



We are *all* suppliers and customers.

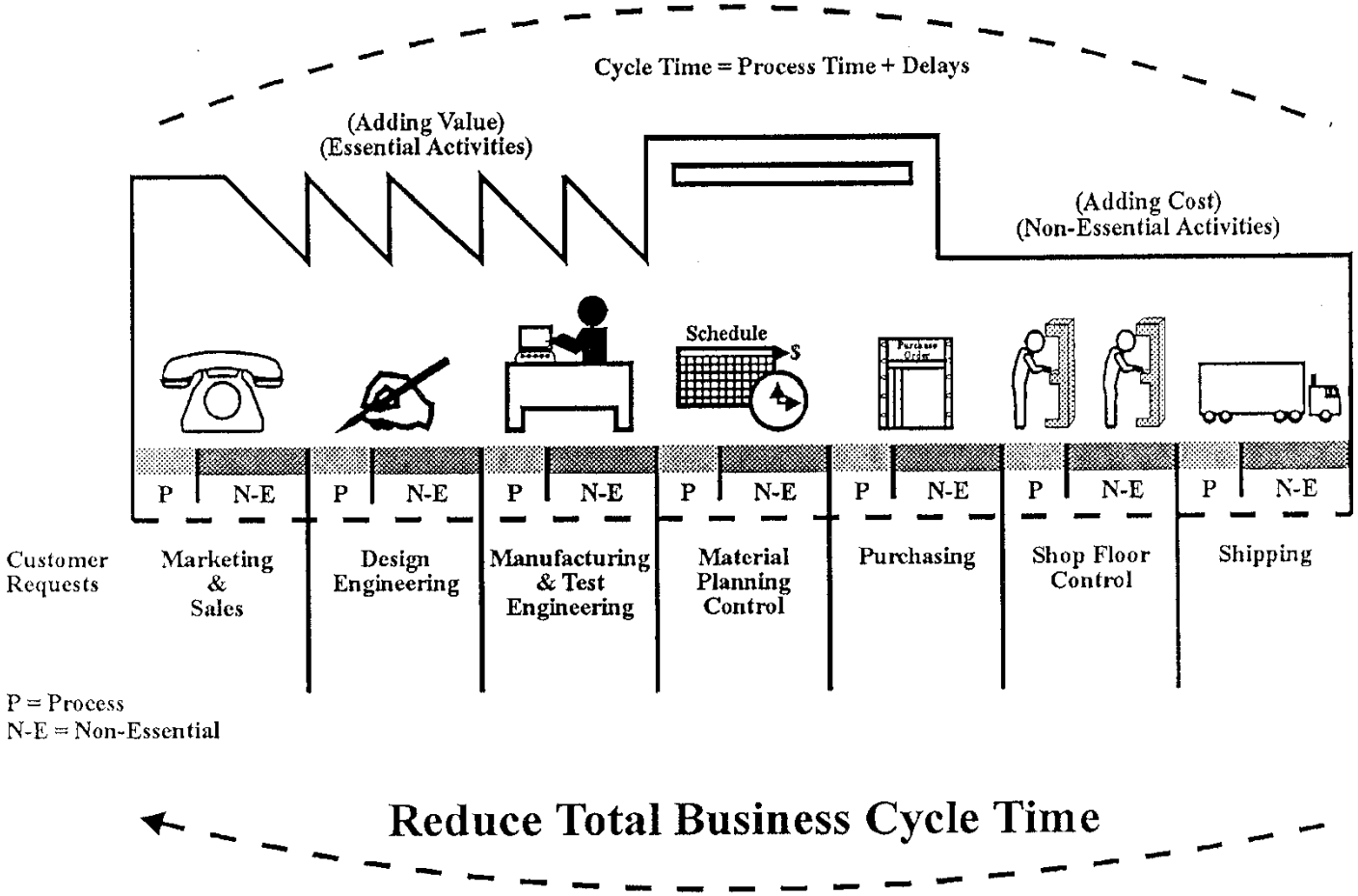
(The internal customer concept)

The relationship *must* be based on mutual trust and respect.

BUT……..
THIS IS A MUCH MORE EXACTING & STRESSFUL CONCEPT THAN JUST MEETING OUR OWN GOALS

NEXUS

Traditional Business Flow

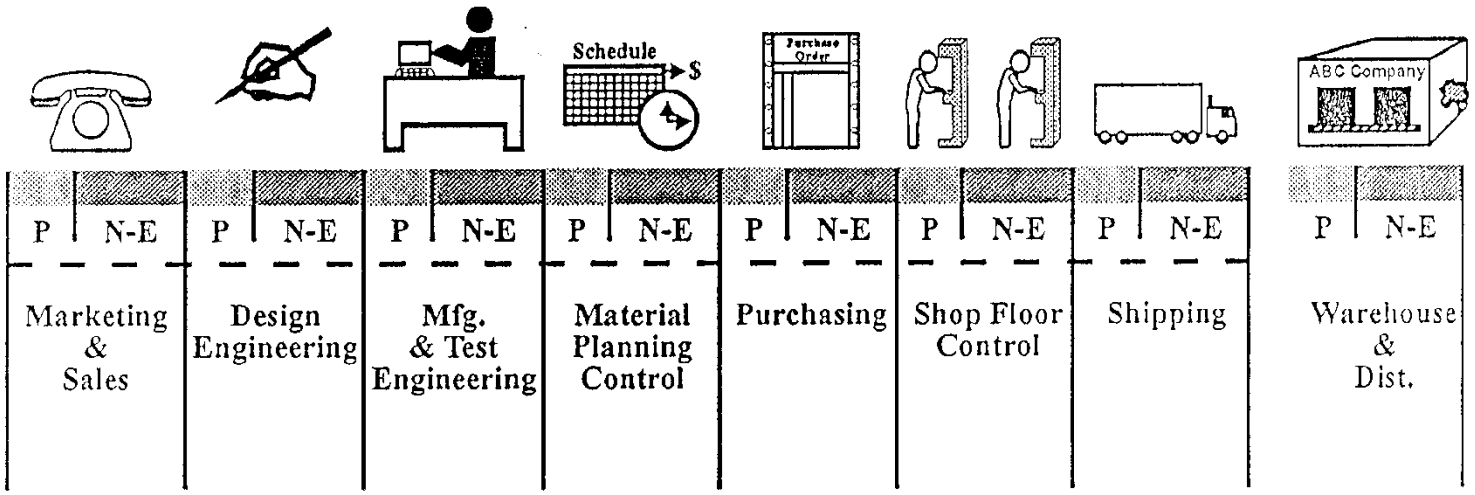


Reduce Total Business Cycle Time

NEXUS

Reduce Total Business Cycle Time

Cycle Time Activities	=	Activities That Add Value And Are Essential	+	Activities That Add Cost And Are Non-Essential



P = Process
N-E = Non-Essential

Comparison Of Operating Models

Lead Time	= Transport	+ Store	+ Changeover	+ Run	+ Wait	
Cycle Time	= Delay	+ Delay	+ Delay	+ Run	+ Delay	
	= NVA	+ NVA	+ NVA	+ VA	+ NVA	
	= Waste	+ Waste	+ Waste	+ VA	+ Waste	

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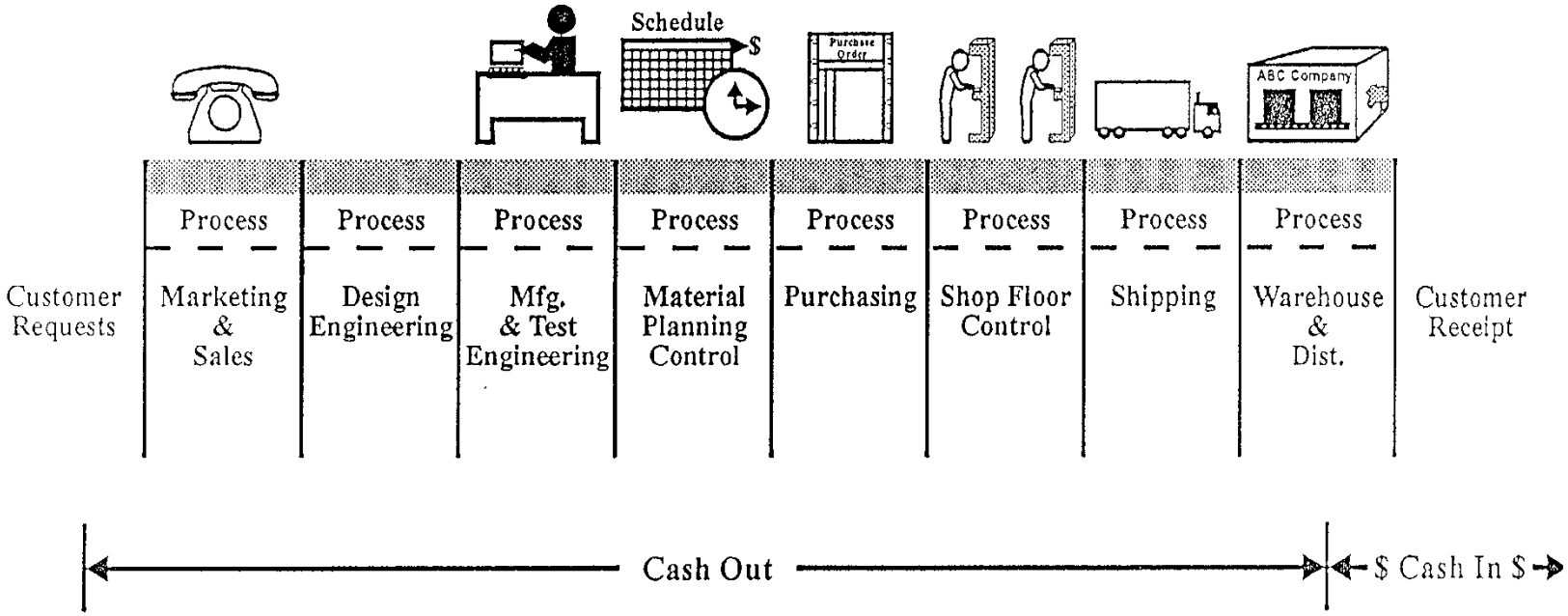
Goal Number One: Delay Elimination

Cycle Time = Process Time

(Adding Value 100%)
(Essential Activities Only)



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Definitions

- Value Adding Operation
  - An operation that transforms or shapes a product/interacting/ service towards that which is sold to a customer
- Non-Value Adding Operation
  - Those operations that take time, resources or space, but do not add to the value of the product/interaction/service itself

- Delays/Bottlenecks/Excess
  ↓
- Non-Value Adding
  ↓
- Non-Essential
  ↓
- Non-Conversion
  ↓
- Cost Adding
  ↓
- Waste

8 Types of Waste

Waiting
Inventory
Excess Transportation
Over-production
Defects
Over-processing
Excess Motion
Under-utilized Talent

NEXUS

Batch failures
Overtime
Delays
Shortages
Labor Variance
Short ships
SETUPS
Scrap
DEFECTS
WASTE
NEXUS

Why does so much Non-Value Adding work occur?

Because . . .

. . . we have not traditionally looked at our business as a set of interconnected processes.

Because . . .

. . . we have failed to recognize that all functions belong to one cycle and have to work together.

Because . . .

. . . things happen not only within a department, but spill out to other departments, and this spillage creates *White Spaces* and no one is accountable for *White Spaces*.

Because . . .

. . . the majority of costs are in *White Spaces* and these costs will not be dealt with unless the whole process is treated and analyzed as one process.

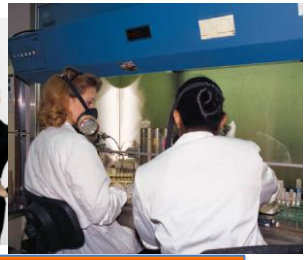
NEXUS

A Typical business process???

Inventors

Marketers

Researchers



Product Teams

Production/Distribution

Happy

Customer

INNOVATION

NEW PRODUCT INTRODUCTION

Discovery

Invention

Research

Development

Commercialization

Launch

Academia

$$$$

A Typical business process???

Inventors

Marketers

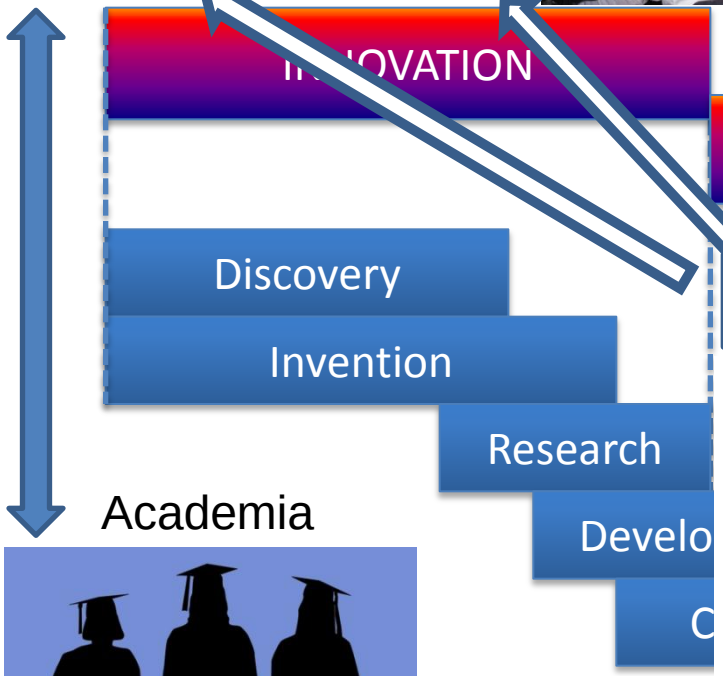
Researchers

Product Teams

Production/Distribution

Happy

Customer



Academia

White Spaces

The time delay between major functions, where less than effective communication linkage can occur, which affects the interaction required between these functions or departments to complete the essential tasks of the business.

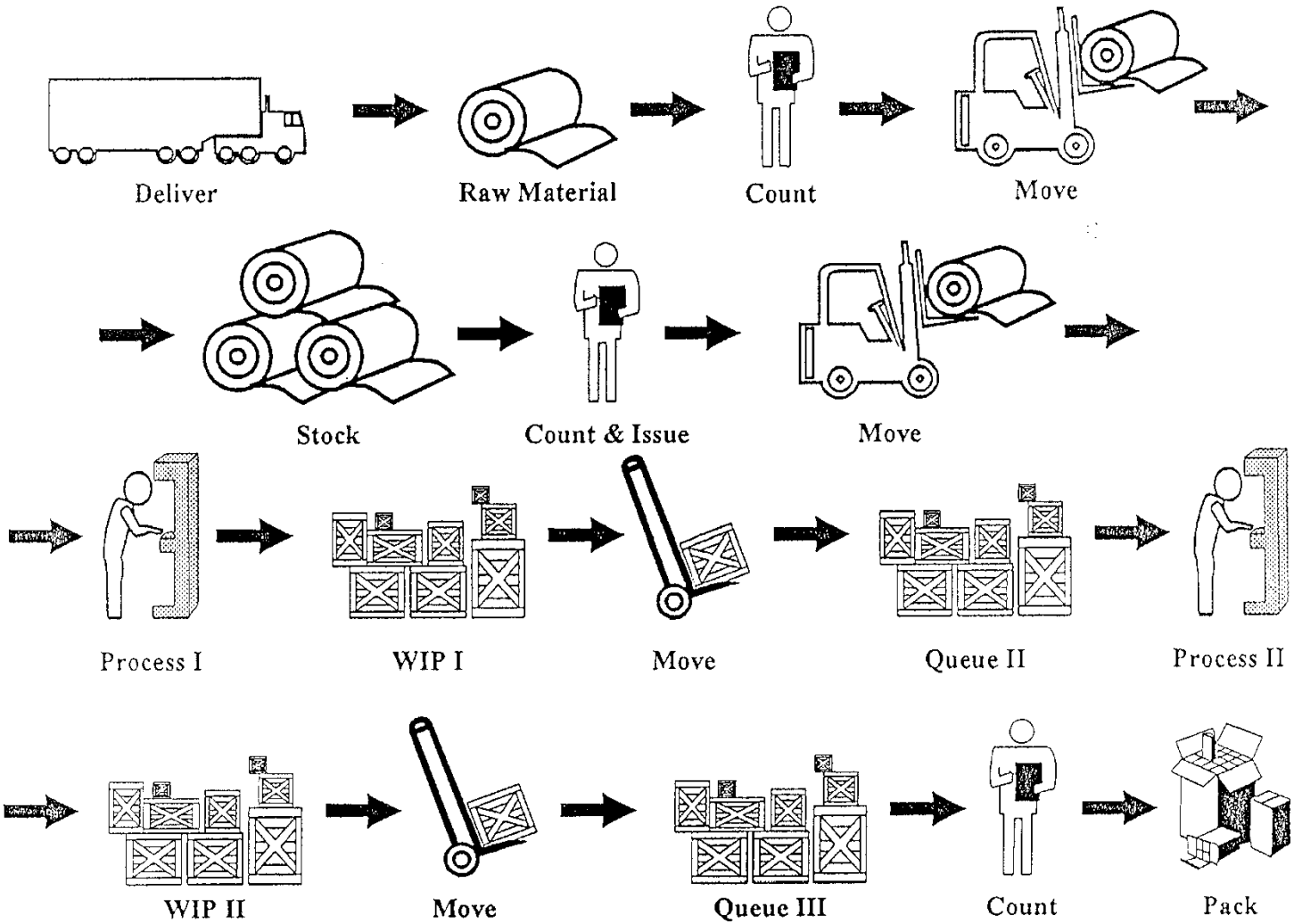
8 Types of Waste

- Inventory
- Overproduction
- Defects
- Over-processing
- Excess Motion
- Waiting
- Excess Transportation
- Unutilized Talent

NEXUS

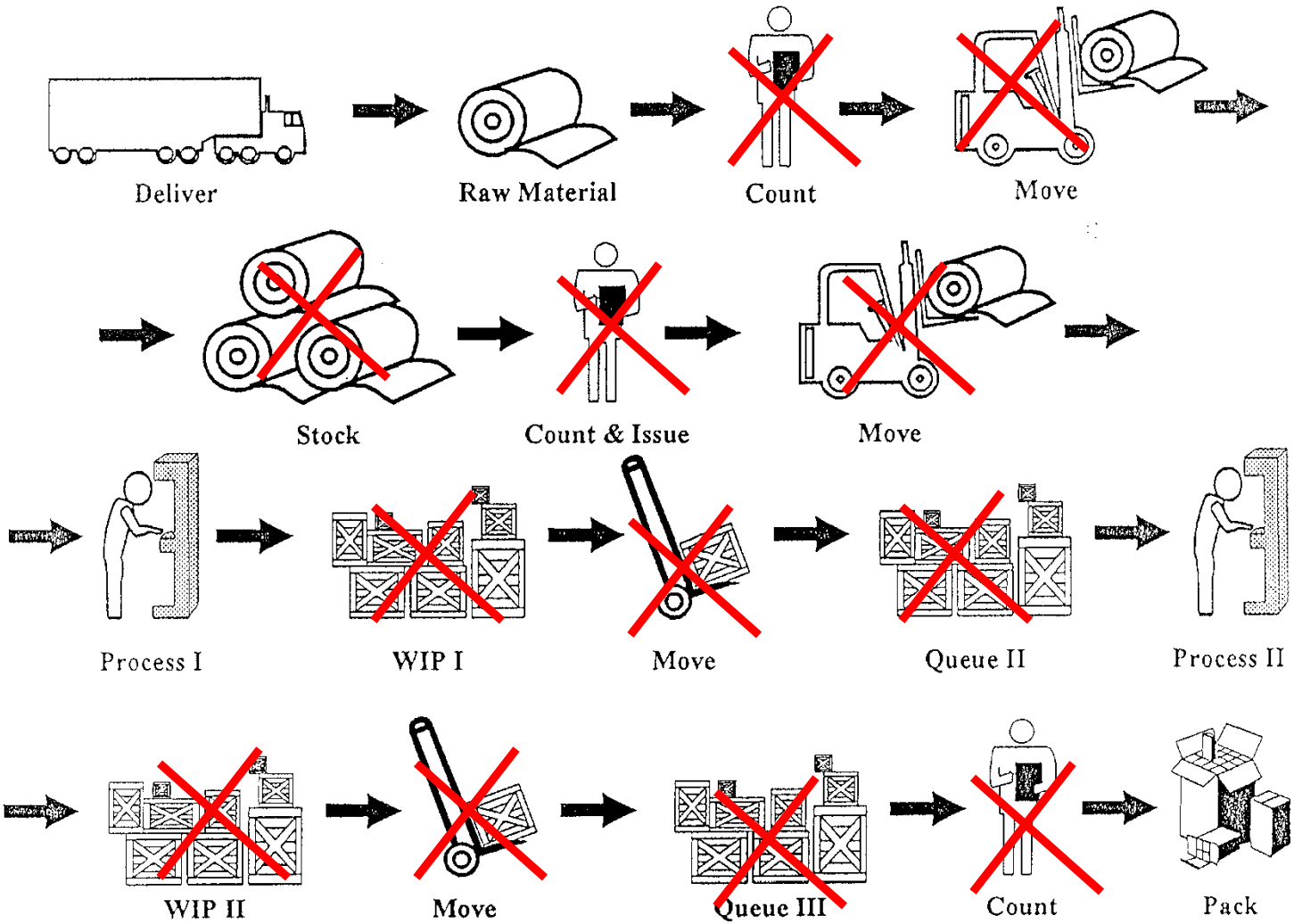
16 Activities From Raw Material To Packaging . . . (12 Are Waste!)

BASELINE



NEXUS

16 Activities From Raw Material To Packaging . . . (12 Are Waste!)



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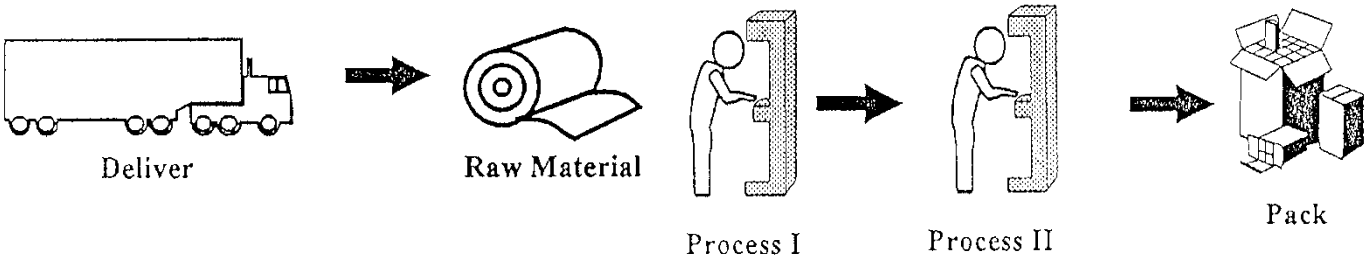
The LEAN Version (Entitlement)



With LEAN but low capital

Note:

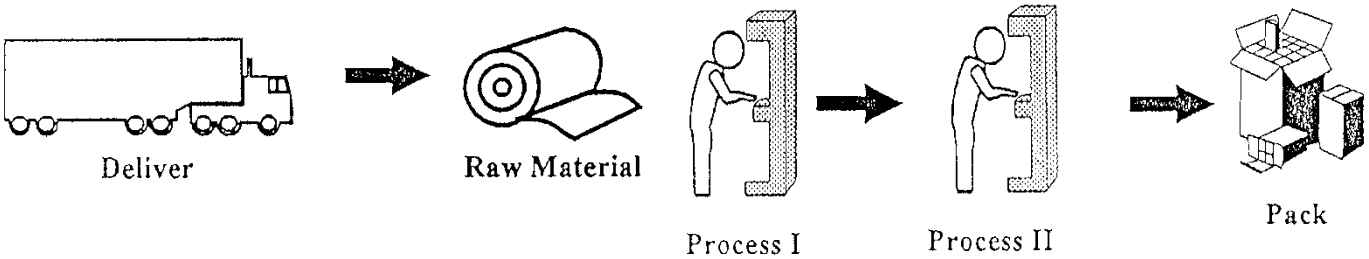
Baseline..Where you are now!

Entitlement… with Lean but low capital

Benchmark… Capital and Technology

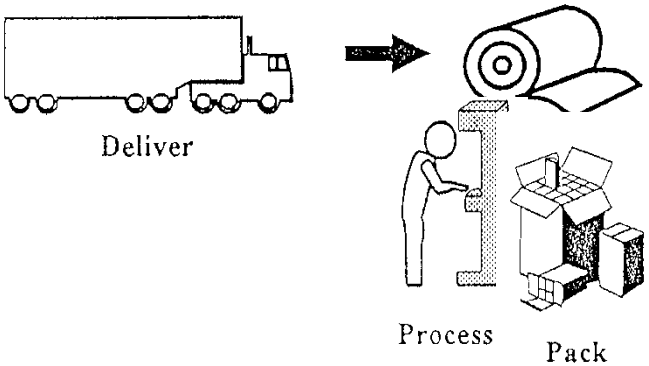
NEXUS

The LEAN Version (Entitlement)



With LEAN but low capital

The LEAN Version (Benchmark)



Add Capital and Technology

Note:

Baseline..Where you are now!

Entitlement… with Lean but low capital

Benchmark… Capital and Technology

NEXUS

Business Process Flow

Strategic Goal

Evolve Toward The "Perfect Business Process"

Lowest cost and highest quality via:

- Minimal cycle time
- Zero yield loss
- Zero scrap or rework
- Improved labor utilization and efficiency
- Total flexibility
- Perfect quality
- Minimal support/maintenance costs
- Minimal non-value adding activities
- Minimal material handling or transportation
- Low to zero changeover time
- Batch size = 1
- WIP ratio > 1

This will be achieved through the planned implementation of technical, procedural and organizational modifications to the present business process.

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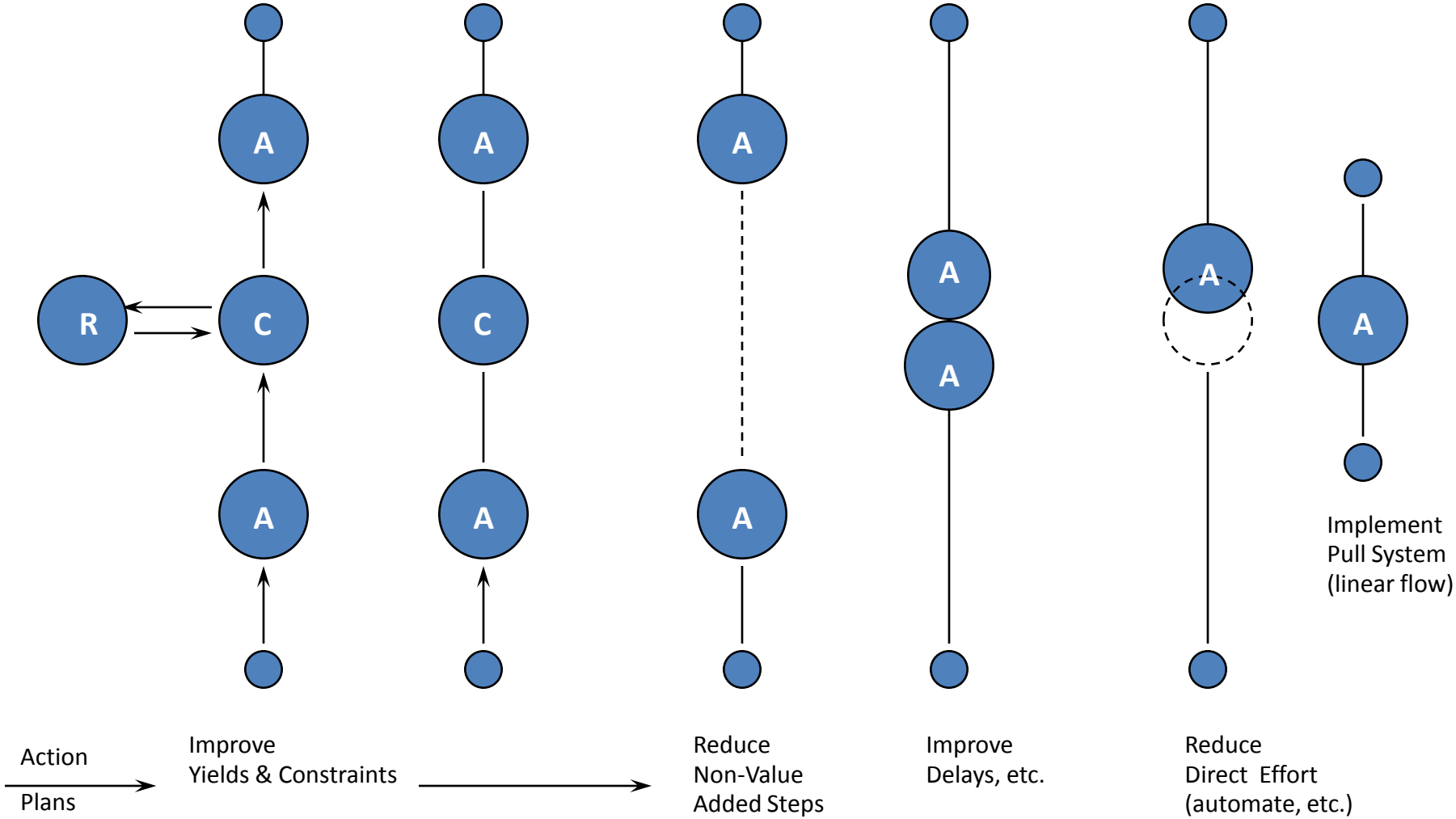
Business Process Evolution Steps



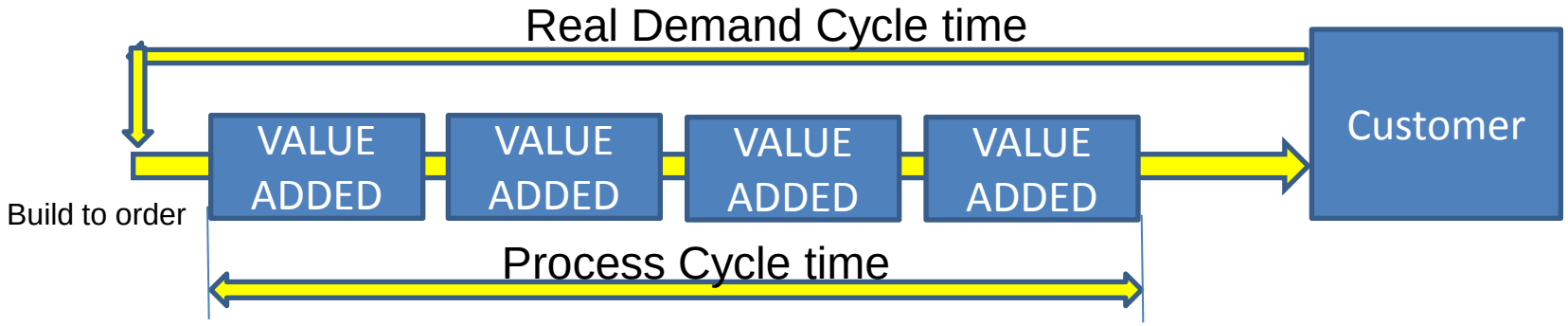
Legend: A = Activity C = Check R = Rework

NEXUS

Linear Flow

- **Utilize a perfect business process (as much as possible)**
- **Adopt an appropriate business process strategy**
- **Linking all parts of the business process**
- **Reduce Business cycle-time inside customer demand**
- **Only produce to "real" customer demand (sell true capacity)**

Example



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Imagine the Vision

- **Cycle time inside customer expectations**
- **Faster time to market capability**
- **Minimal Inventory and waste in all forms**
- **Perfect or Improved quality (Product /Process/Services)**
- **Total Cost performance excellence**
- **Greater productivity and increased gross margins**
- **Reduced working capital**
- **Increased cash-flow cycle & need for credit**
- **Employee Participative and Empowerment culture**
- **A distinct competitive edge.**

NEXUS

CYCLETIME IMPROVEMENTS POSSIBLE.

Business type	Make –ship	New Product Intro
Discrete manufacturing	2 W to 2 D	12W to 4 W
Custom Fabricators	1 W to 1D	2W to 2D
Process industries	8H to1H	12W to 4 W
Service	2H to 0.25H	12W to 4 W
R@D	NA	2yrs to 0.5 yrs

NEXUS

The LEAN business…

The application of this Cycle Time reduction "thought-ware" is called "lean thinking"

It can be applied to any business or process!!!

Some call it "LEAN Manufacturing"….
It should be called "LEAN business"….

We called it Business Cycle time Management when we wrote the book!!!…. "LEAN" had more commercial appeal…

NEXUS

The things in daily life that are LEAN….

Eyeglasses…. 1 hour!!!…
Paint colors…. Mixed in store
Pizza delivery…. 1 hour and sometimes free
Video conferencing…. NOT business travel
Non coin tolls on highway
British Round- A-Bouts
Pay for gas at pump
Cell phones
Internet banking
Self serve/checkout stores
Internet movies
Car Rental (some)
Internet shopping?
www information

NEXUS

The things in daily life that are LEAN….

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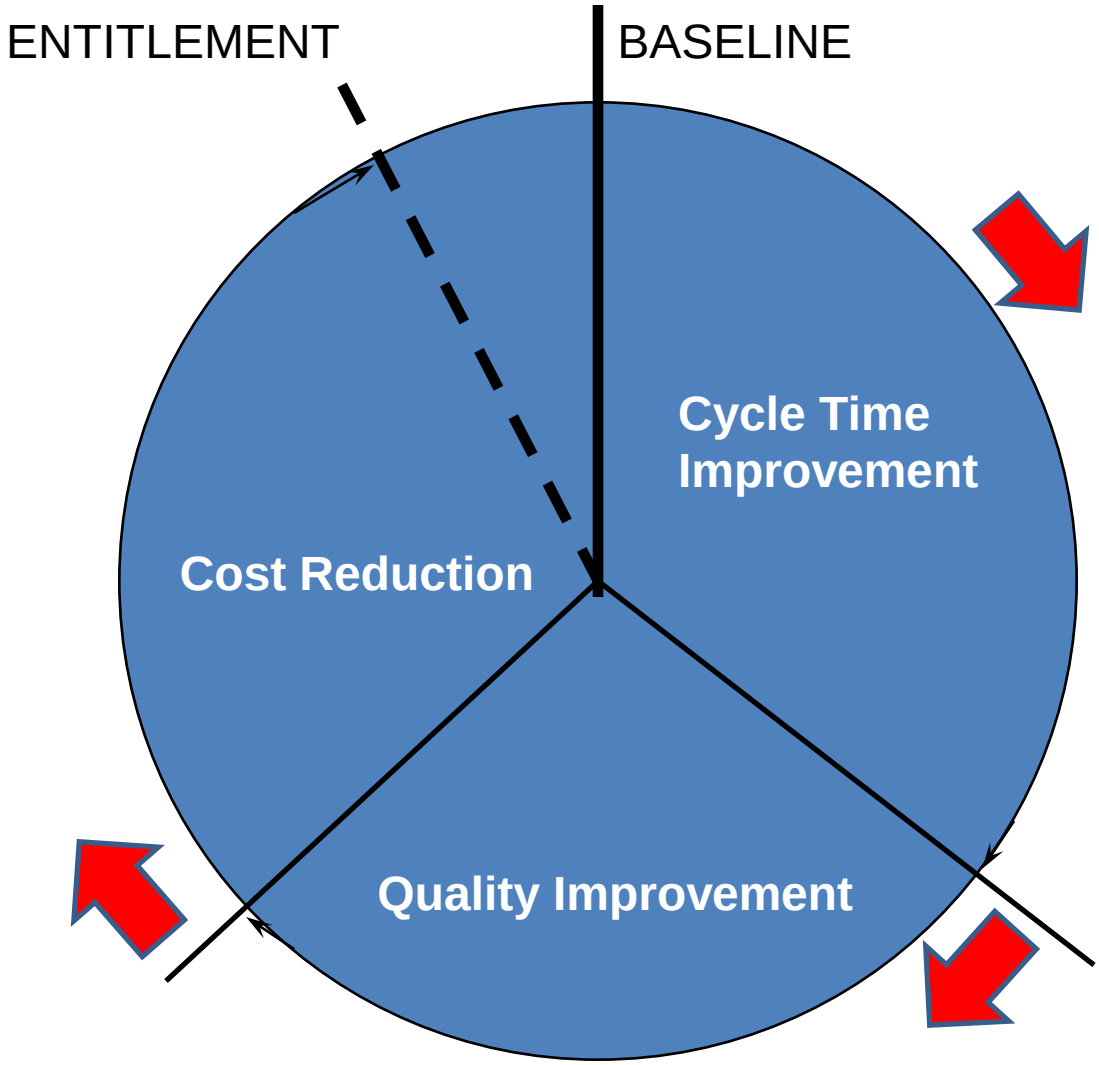
Self serve/checkout stores
Internet movies
Car Rental (some)
Internet shopping?
www information

NOT Lean

Global Supply Chains
Legal system
Government policy making
Voting system
Heath care systems
Educational system

NEXUS

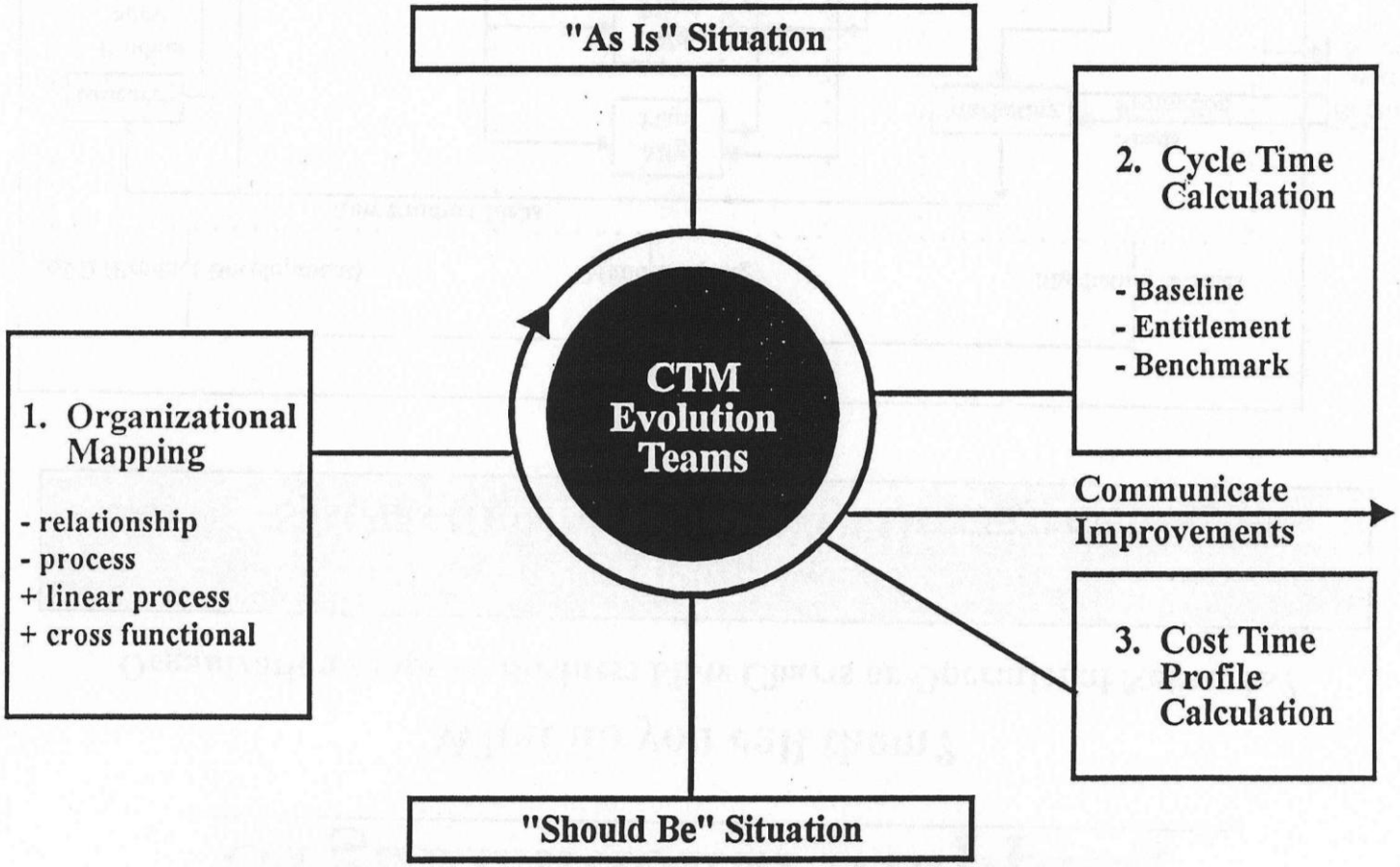
Continuous Improvement Environment



NEXUS

CYCLE TIME REDUCTION TOOLS

(These tools are used interactively to develop the Cycle Time reductions and monitoring improvement performance)



NEXUS

How To Build A Map

(Value Stream Mapping)

Step 1: Define the scope.

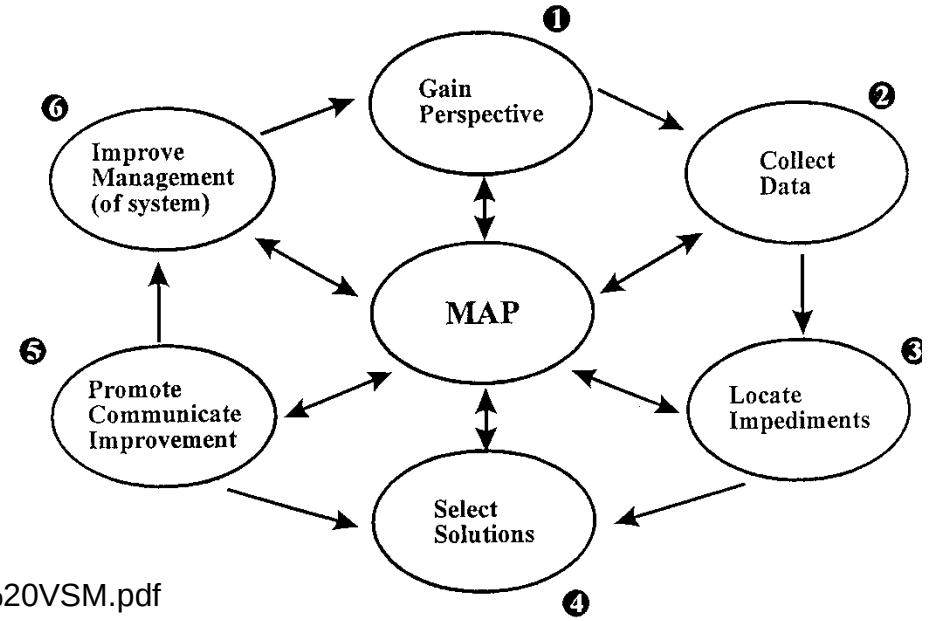
Step 2: Involve the users (the team).

Step 3: Identify and sequence inputs/outputs to sub-systems.

Step 4: Classify and confirm the map.

Step 5: Add time and costs to map.

Use Organizational Maps



How-to sites..

http://www.nwlean.net/toolsCD/VSM/4%20steps%20to%20VSM.pdf

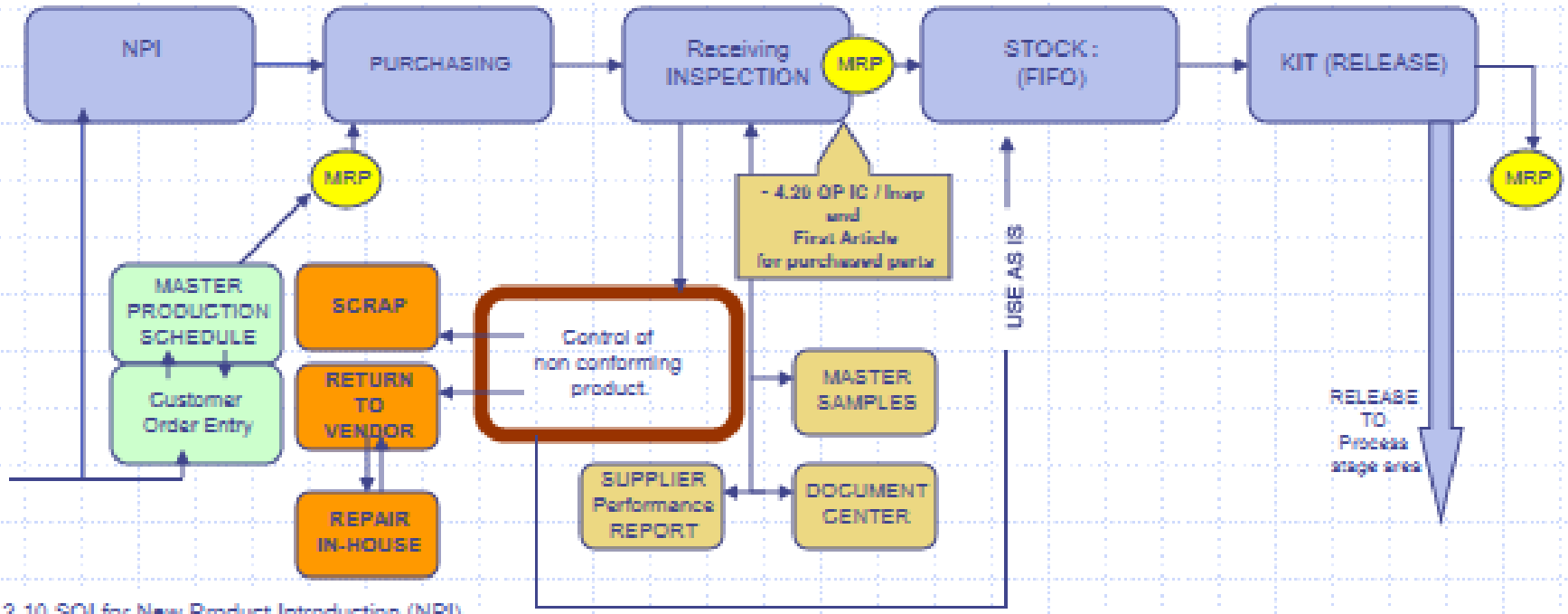
http://www.valuestreamguru.com/?p=53

http://office.microsoft.com/en-us/visio-help/create-a-value-stream-map-HA010113024.aspx

NEXUS

PROCESS FLOW CHART

RECEIVING / STOCK / PRODUCTION RELEASE



- 2.10 SOI for New Product Introduction (NPI)
- 2.11 SOI DFM Rules
- 2.12 SOI for Run At Rate Approval
  - 2.20 QP Design Validation Testing Procedure
  - 2.30 QP Design and documentation control
  - 3.50 QP Tooling and Sample management
  - 7.20 QP Inspection report procedure
  - 2.40 QP ECN procedure
  - 5.20 QP Order Entry & EDI
  - 5.10 QP Production control and work order procedure
  - 5.30 QP MRP report procedures

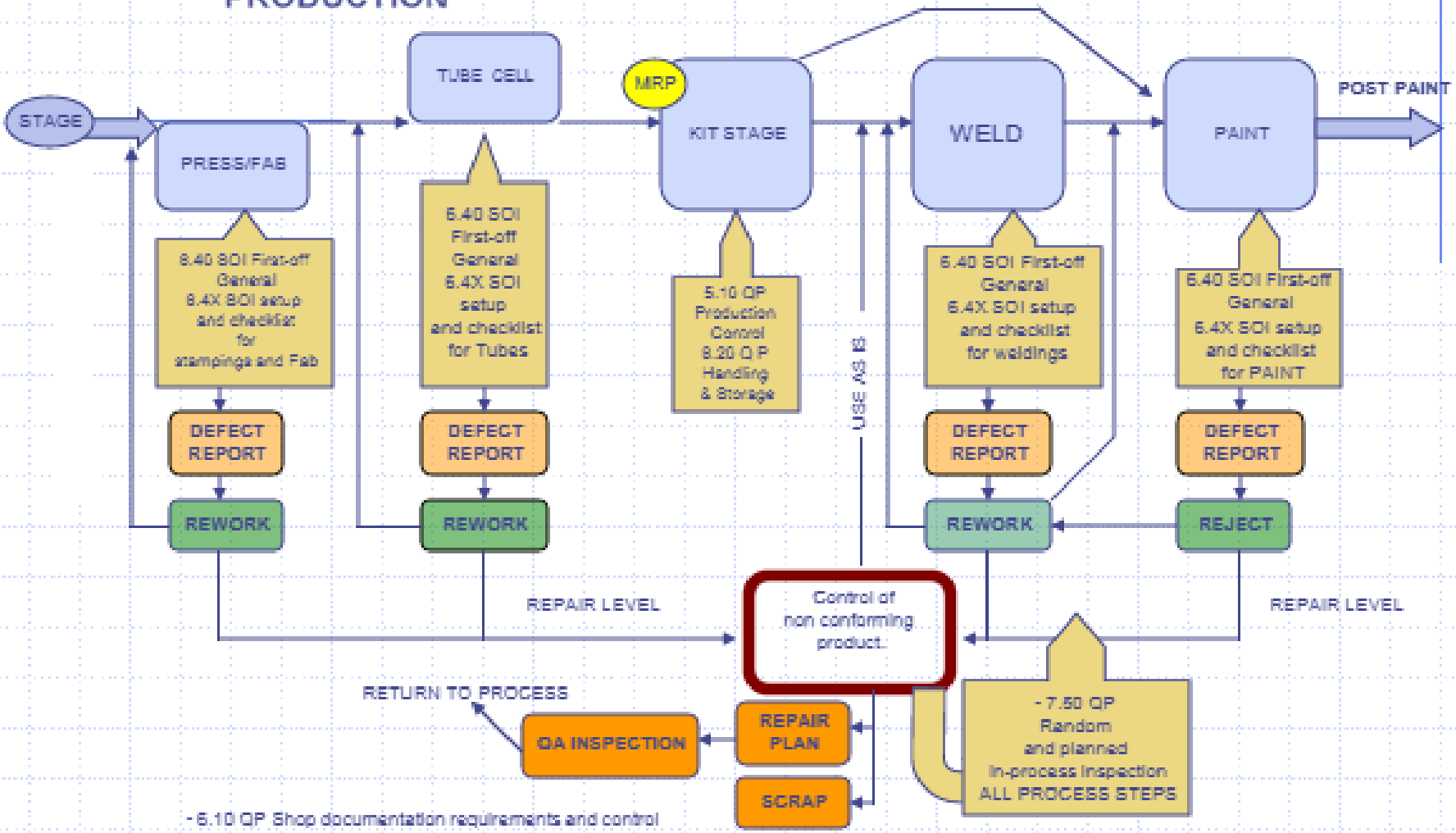
4.10 QP Supplier selection, control and performance

- 4.20 QP Incoming Inspection and First Article for purchased parts
- 4.30 QP Control of Non conforming materials and product
  - 6.20 QP Handling & Storage

NEXUS

PROCESS FLOW CHART

PRODUCTION

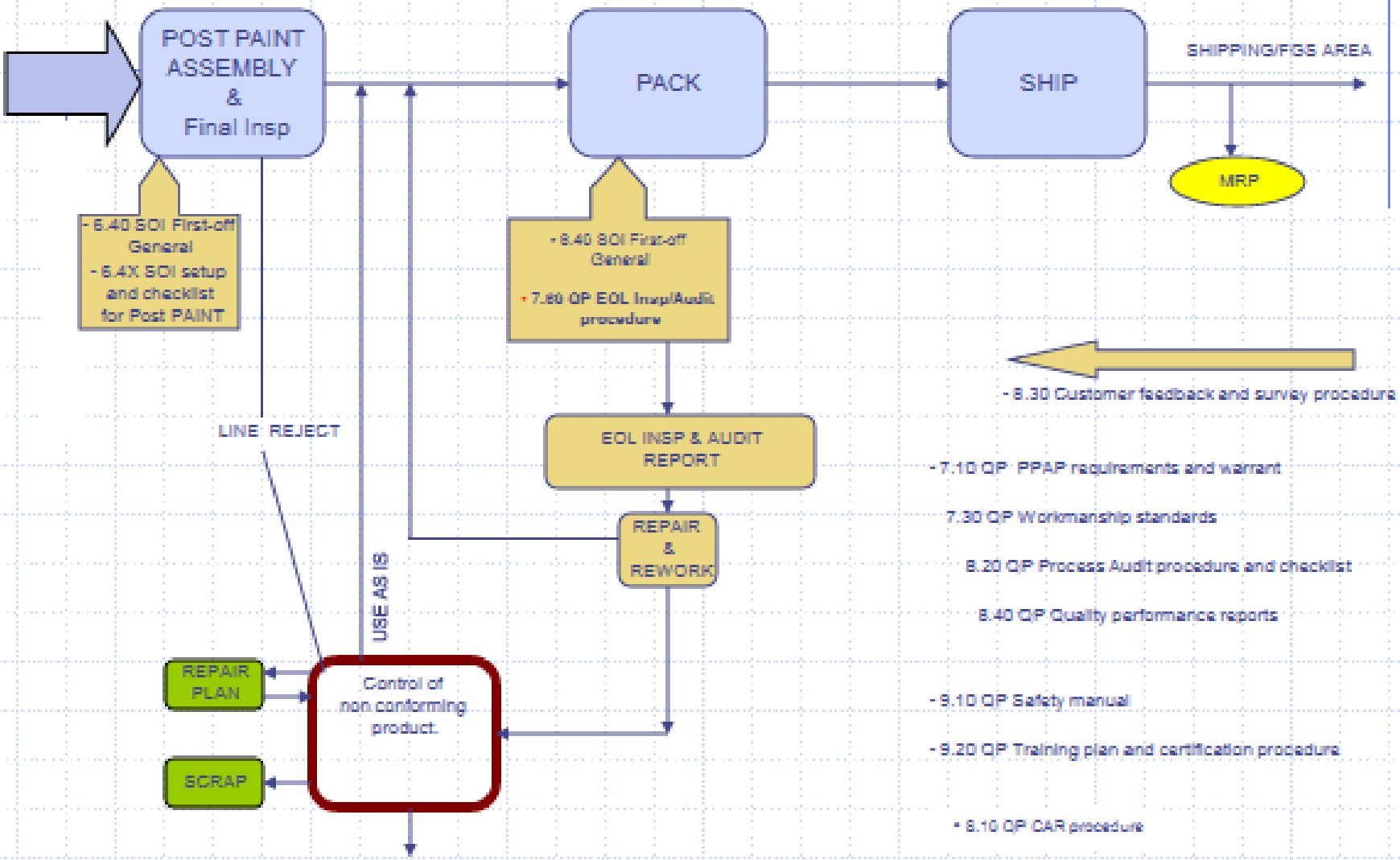


- 6.10 QP Shop documentation requirements and control
- 6.30 QP Plant maintenance plan (master list)
- 7.40 QP Calibration procedure
- 6.40 SOI setup/First-off (Generic)

NEXUS

PROCESS FLOW CHART

FINAL ASSEMBLY /INSP/PACK/SHIP



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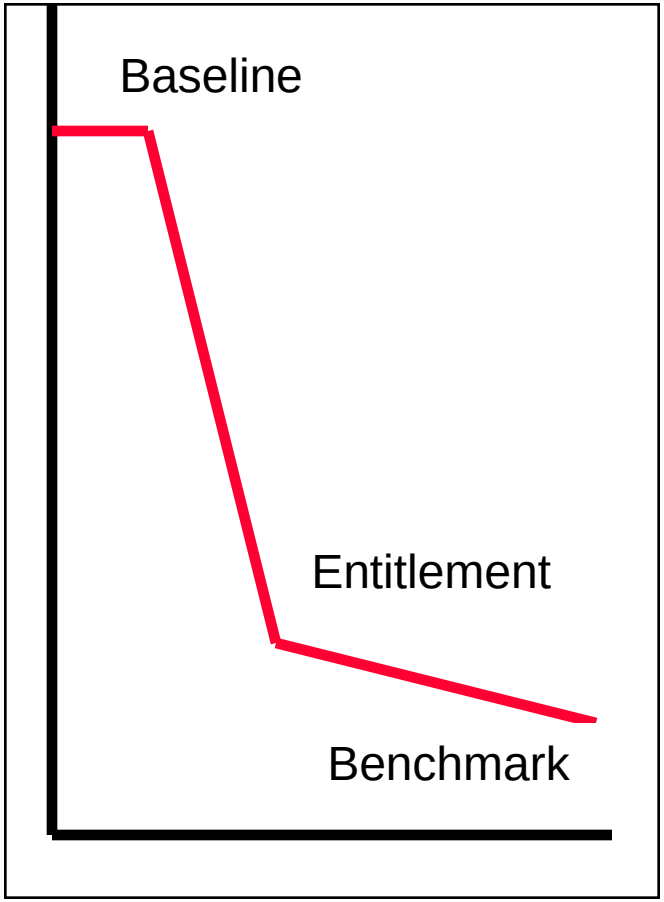
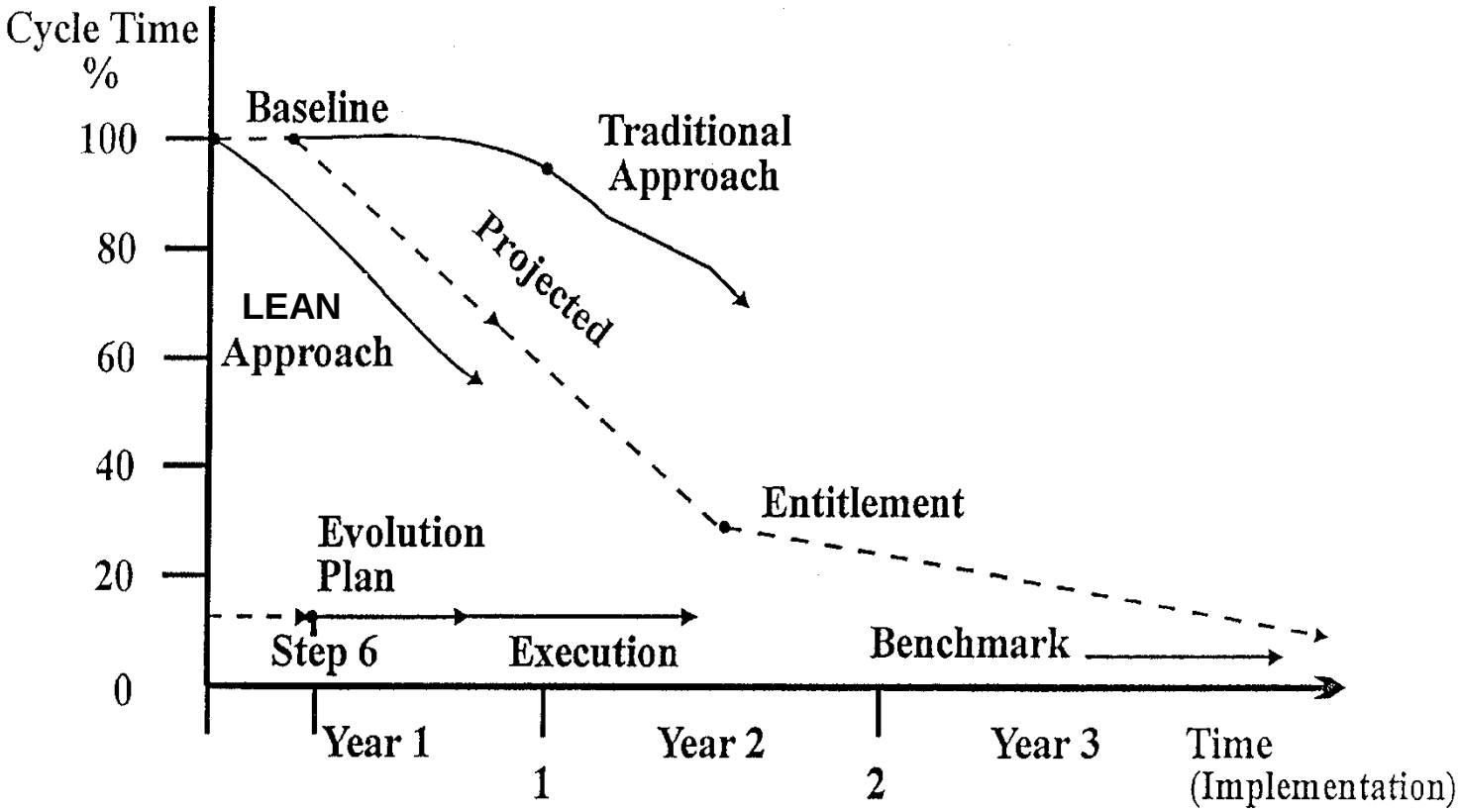
Measurement of Performance



- **Baseline:** Current performance
- **Entitlement:** Level of performance achieved with present resources & capital
- **Benchmark:** Best competitive performance with added resources and technology

NEXUS

Cycle Time Curve (Improvement Profile)



NEXUS

Establishing: Entitlement

- 3 Main Approaches . . .

  1. Historical analysis approach (least aggressive).

  2. Multiples of theoretical cycle time approach.

  3. Innovative approach (most aggressive).

- Perform a distillation of the results . . .

NEXUS

Example 3: Calculation Of Cycle Time

(Multiples Of Theoretical C.T. Approach)

Average	Value	Baseline	Entitlement	Benchmark	Formula
Process Time (PT)		1 Hr/Unit	1 Hr/Unit	.08 Hr/Unit	Measured/Estimate
WIP Ration (WR)		48 Units	12 Units	3 Units	Multiple Approach
Thruput (TR)		200/Hr	200/Hr	240/Hr	Measured
Cycle Time (CT)		48 Hrs	12 Hrs	2.4 Hrs	(PT) x (WR)
WIP Value (WV)		9600 Units	2400 Units	480 Units	(TR) x (CT)
% WIP Reduction		0%	↓ 400%	↓ 2000%	—
% CT Reduction		0%	↓ 400%	↓ 2000%	—

Note:

CT = PT x WR (or batch size)

WV = Thruput Rate x CT

$$\text{WIP Ratio} = \frac{\text{"TRUE" * Work In Progress}}{\text{Actual Total Inventory In Process}}$$

** Value Added Operations Only*

$$\text{WIP Ratio} = \frac{\text{Total WIP}}{\text{Thruput Rate}}$$

NEXUS

Example 4: Make/Ship Loop Cycle Time

Operation	Baseline Cycle Time	Cum Cycle Time	Entitlement Cycle Time	Cum Entitlement
Customer Quote Cycle	20	20	5	5
Order Entry	5	25	3	8
Planning Visibility	15	40	2	10
FAB (Run Makeup)	5	45	2	12
FAB	28	73	14	26
Sort (Probe)	7	80	3	29
Die Bank	1	81	1	30
Offshore Shipment	5	86	2	32
In Transit Offshore	3	89	3	35
Receive Offshore	7	96	3	38
Offshore Assembly Test	11	107	9	47
In Transit Return	3	110	3	50
Prepare Paperwork And Ship	2	112	1	51
Total Days	112		51	
Weeks	22.4		10.2	

NEXUS

Establishing: Benchmark

- Understand baseline!
- Make progress towards Entitlement first! (Improve effective use of baseline resources.)
- Avoid unnecessary capital expenditure until requirements for Benchmark is understood!
- Pursue knowledge of Industry Best-In-Class performance levels!
  (Know the better competition!)
- Simulate the "value added" of new technologies/ methods over know entitlement levels.

NEXUS

Benchmarking

- Review with Measurements who is “best in class”
  - In your industry
  - In any industry with similar process or conditions.

- Study why they are better and try to apply to your own business.

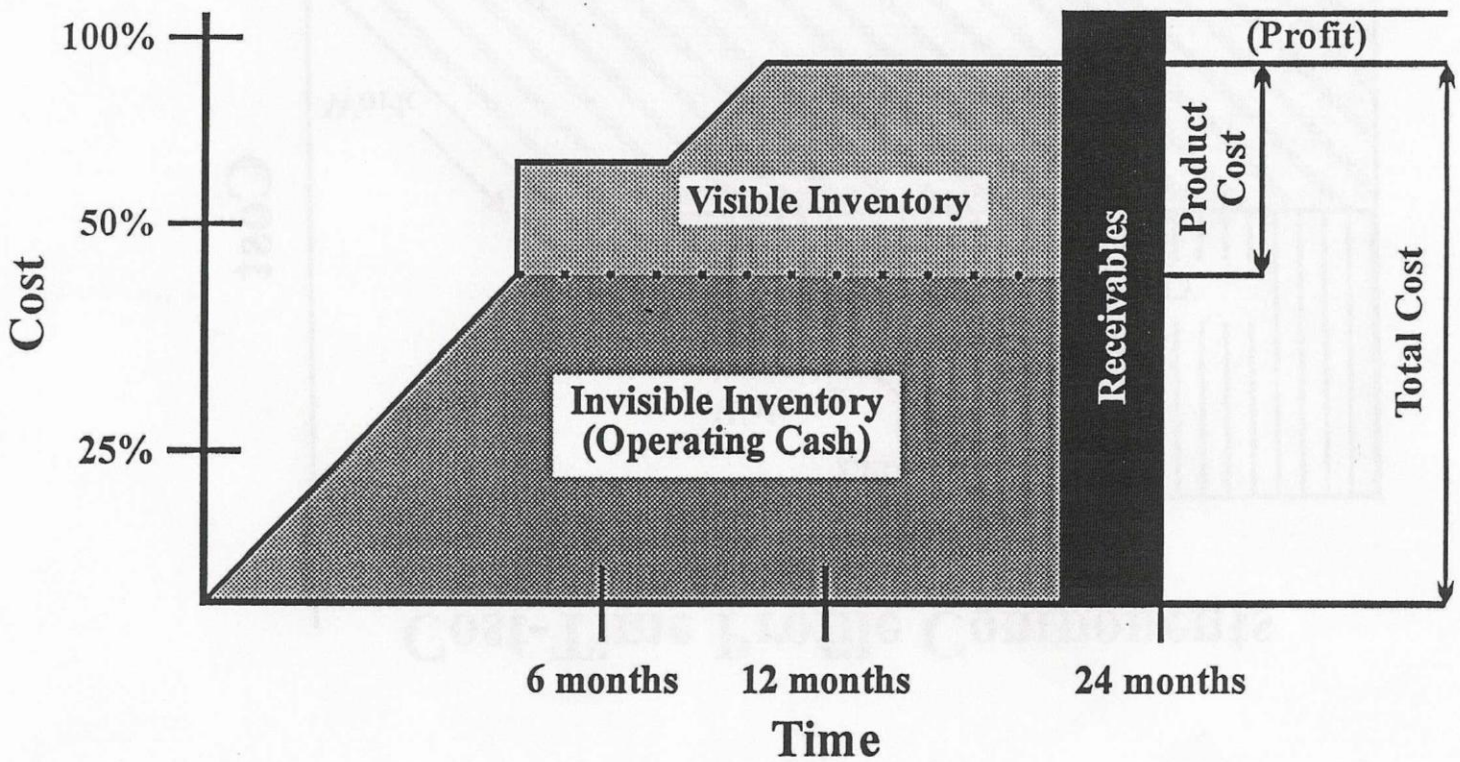
NEXUS

The Cost Time Profile

A *cost-time profile* is a graphic representation of the accumulation of cost for a product or service as it passes through its entire cycle in the business operation.

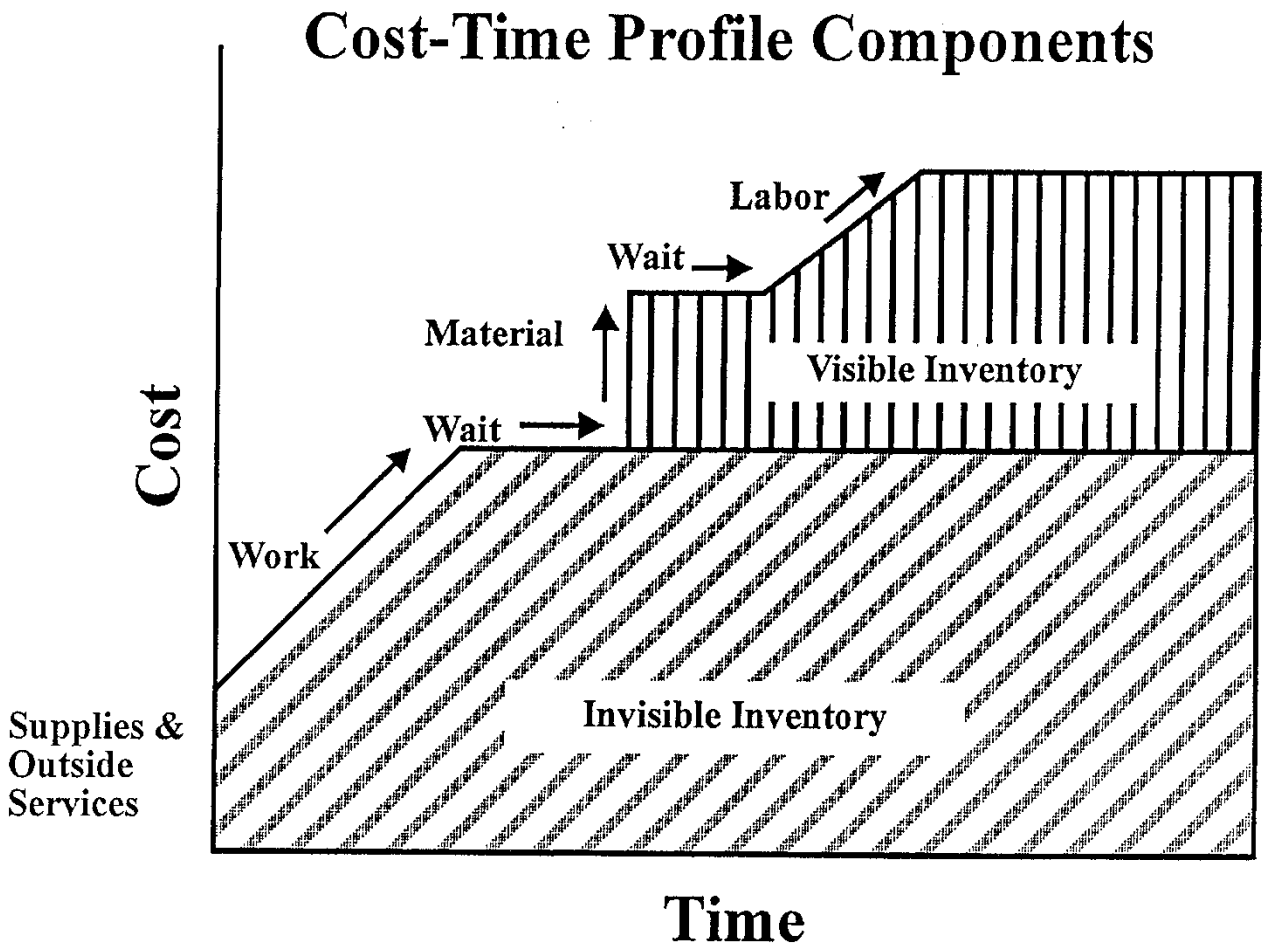
How much money is tied up in:

- Obtaining work!
- Making the product!
- Delivering it!
- Providing the service!
- Getting paid!



NEXUS

Generic Cost-Time Profile



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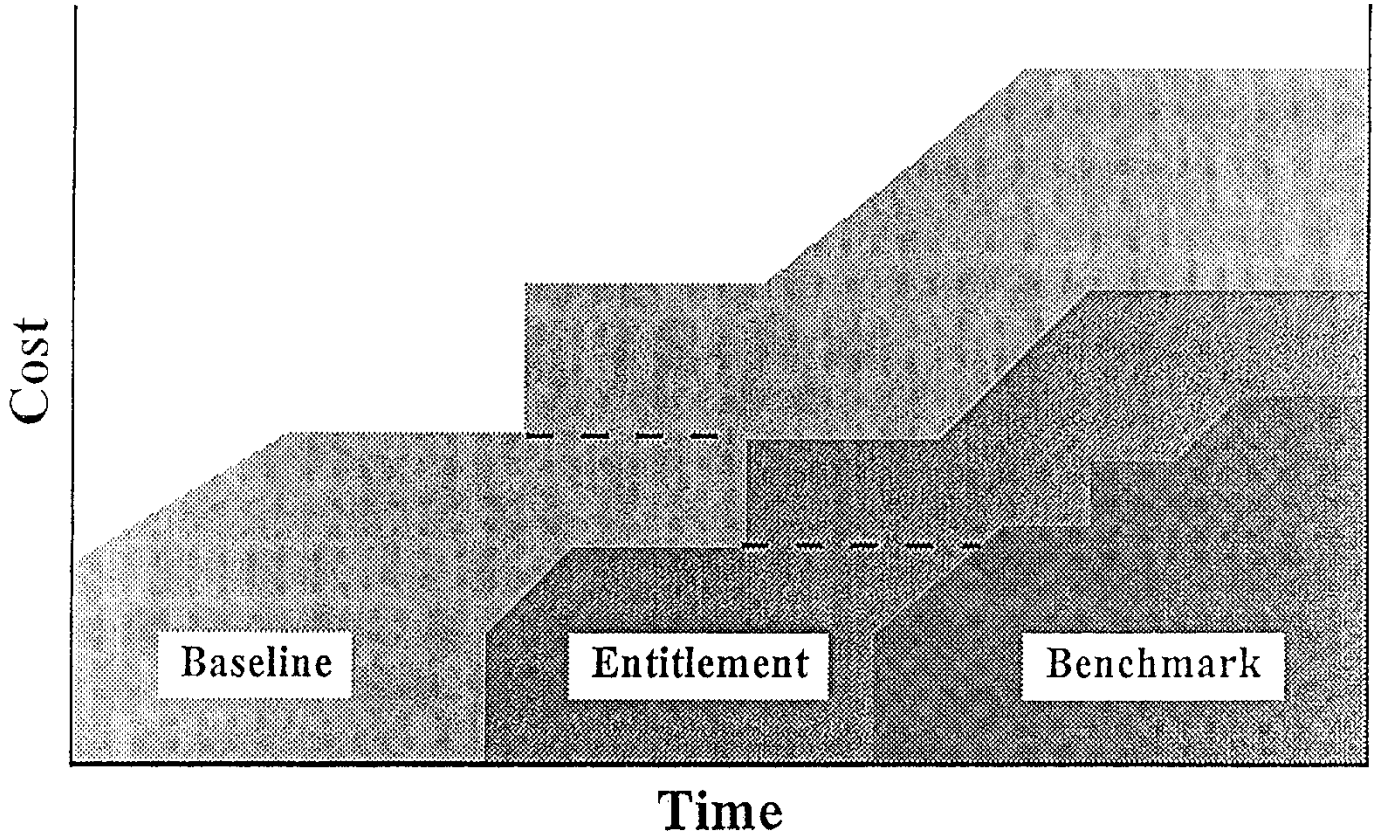
Cost Time Profile
"As Is" and "Should Be"



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LEAN-ing Toward Success…

The 6 Step Approach

1/ Get Help/Learn the tools

2/ Develop your vision

3/ Build your Evolution plan

4/ Start making changes via projects

5/ Get some successes

6/ And keep it going

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Develop your *vision*

1/ Divide into 5 business loops

2/ Baseline Map each loop (prioritize which loops)

3/ Cost-Time profile the baseline

4/ Review and analyze with VA/NVA tools.

5/ Use Waste identification survey

6/ Define Entitlement (should be) visioning

7 Document the vision

8/ Explain to all in the organization.

9/ Manage the pressure of change….

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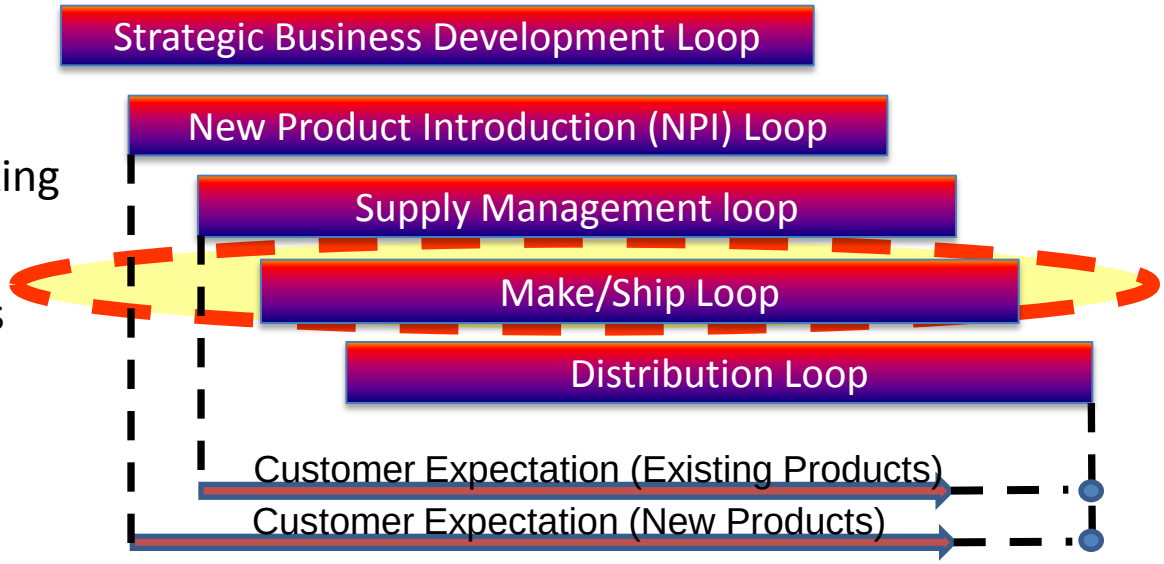
The 5 Cycle Time Loops in any Business

- Who is the customer?
- Must think holistically !
- From Vertical to Horizontal thinking
- The 5 Loops in the business
- Use the 5 Loops to provide focus

5 Business Loops



"Total Cycle Time" …The actual time elapsed from when a customer expresses a need for that product or service, until the time the customer's need is satisfied, and payment is received.

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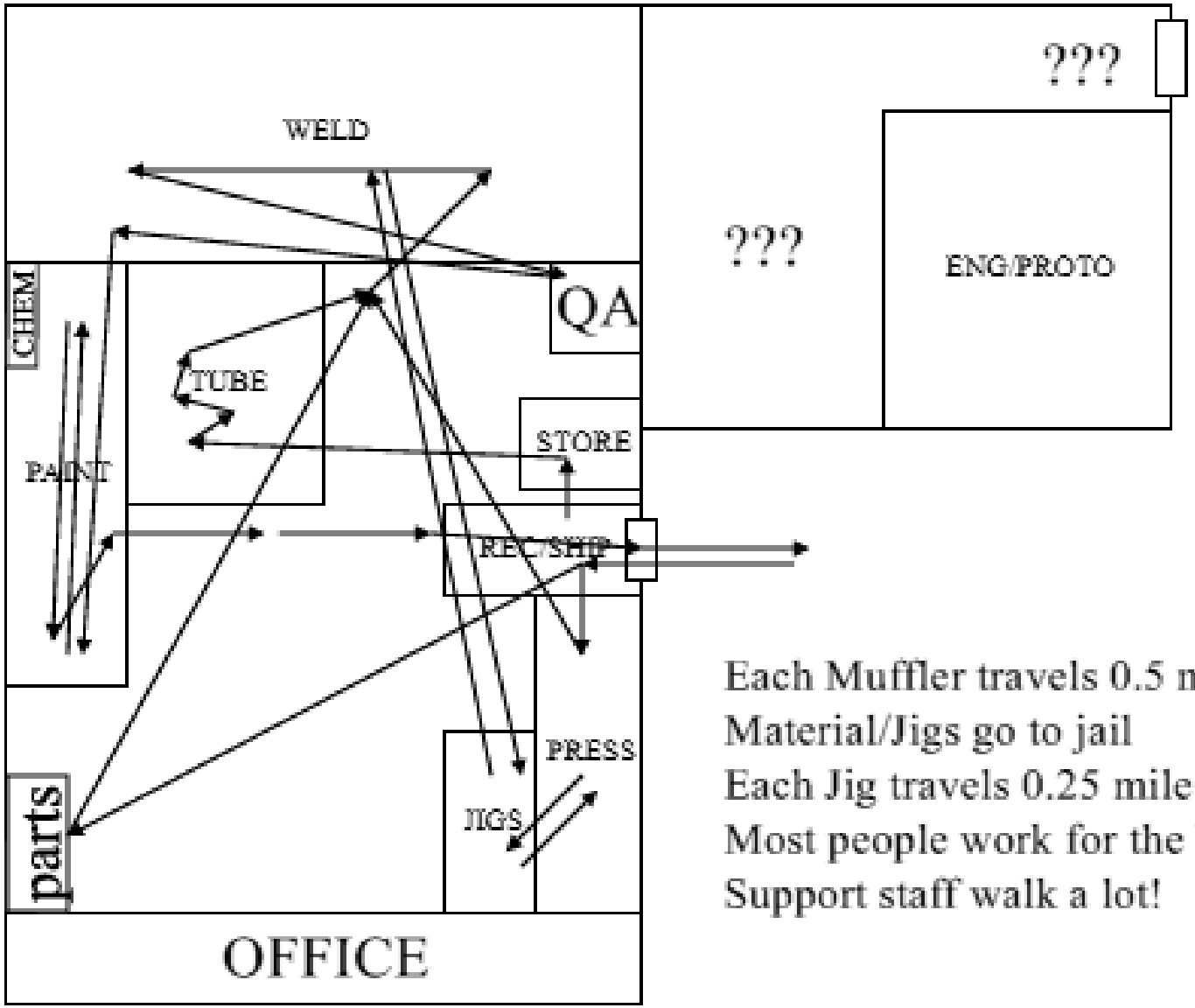
EXAMPLE

EXISTING ACS FACILITY LAYOUT & FLOW



Each Muffler travels 0.5 mile
Material/Jigs go to jail
Each Jig travels 0.25 mile per week
Most people work for the baskets
Support staff walk a lot!

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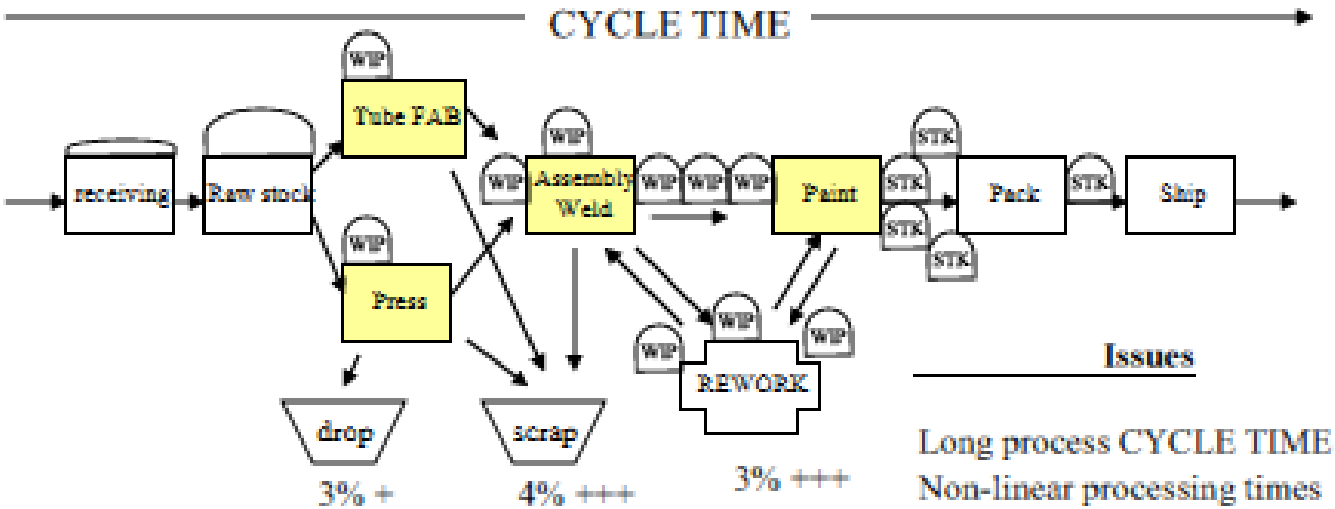
ACS EXISTING (Baseline)



Issues

Long process CYCLE TIME
Non-linear processing times
Low direct process productivity
Very Disrupted process flow
High inventory levels ($700,000 or 2 months of stock)
High levels of stock in "waste" baskets
High scrap/rework
High number of secondary operations
Large setups (low **Flexiblity**)
Some process downtime (low **Relability**) No PM
Low level of workforce motivation
Low process/product **Capability**
Opportunity to reduce waste in chasing problems

Process CT Baseline = 7days?plus (6 to 8 weeks of WIP)

Pt=0.5hrs (standard hours or value-added time)

Process CT Entitlement =3*Pt+dwell+pack
= 3*0.5 + 1.0 +0.5 =3 Hrs

VA to NVA ratio is 6*40*2/2 = 240 times !!!!!

(VA = value added
NVA = non-value added)

EXAMPLE

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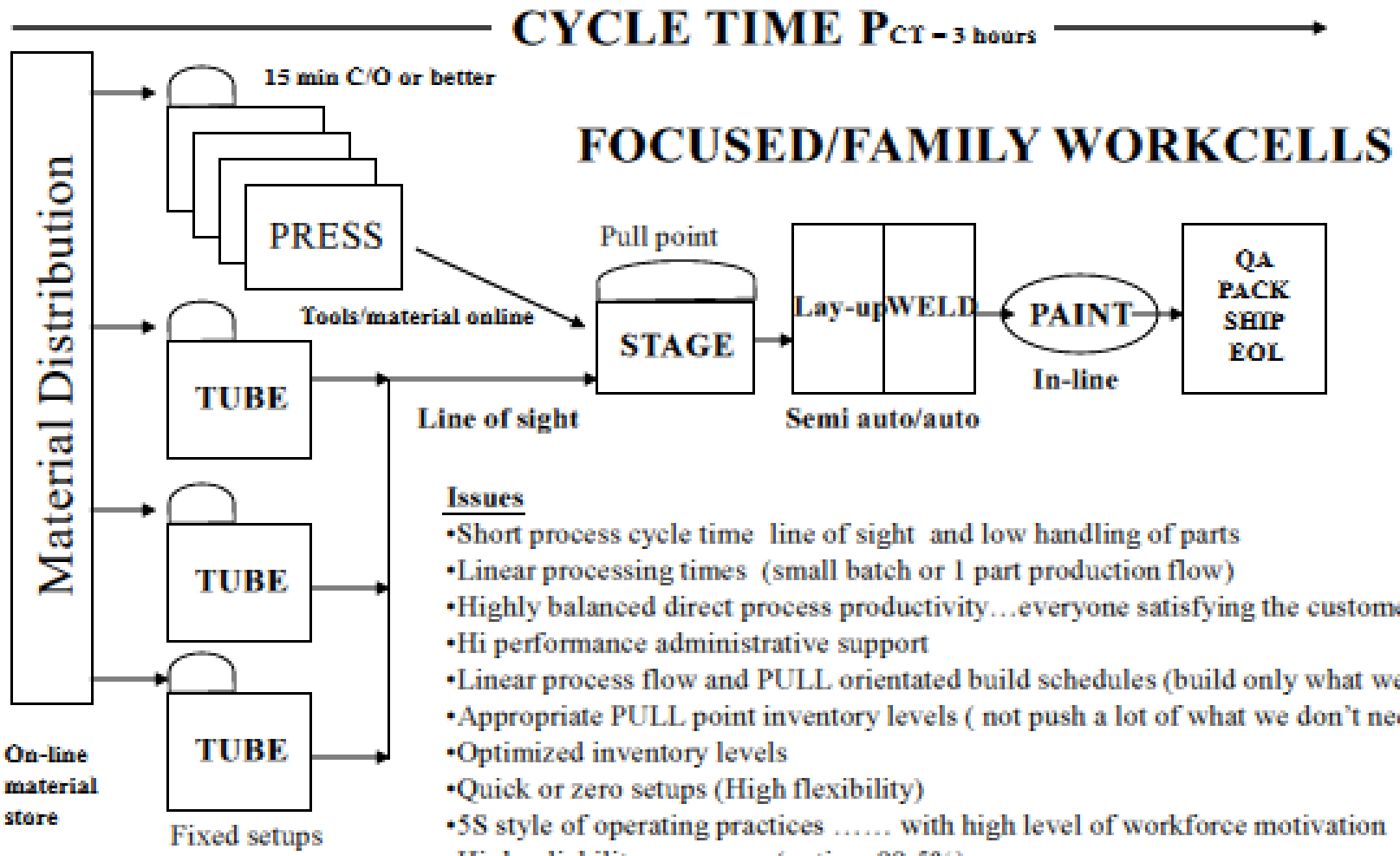
PROCESS ENTITLEMENT (where we want to be)

EXAMPLE



Issues

- Short process cycle time line of sight and low handling of parts
- Linear processing times (small batch or 1 part production flow)
- Highly balanced direct process productivity…everyone satisfying the customer
- Hi performance administrative support
- Linear process flow and PULL orientated build schedules (build only what we need)
- Appropriate PULL point inventory levels (not push a lot of what we don't need)
- Optimized inventory levels
- Quick or zero setups (High flexibility)
- 5S style of operating practices …… with high level of workforce motivation
- High reliability processes (uptime 99.5%)
- **Very low scrap/rework …. low Cost Of Poor Quality**
- **Zero secondary operations ..careful design and process compatability**
- **DFM/Six Sigma Product capability (Rolled yields of 99.9% (1000ppm)**

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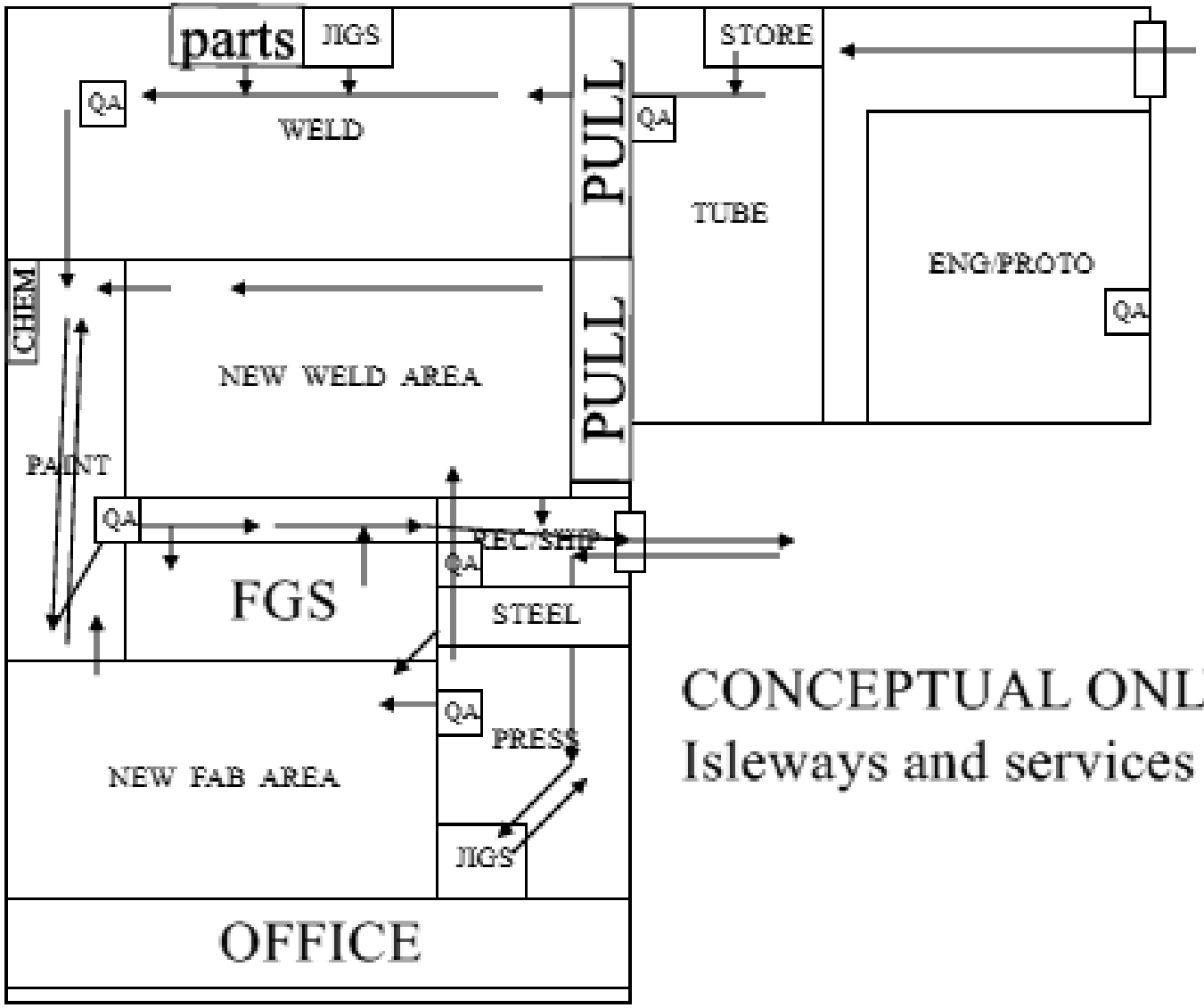
EXAMPLE

PROPOSED ACS FACILITY LAYOUT & FLOW



CONCEPTUAL ONLY

Isleways and services excluded

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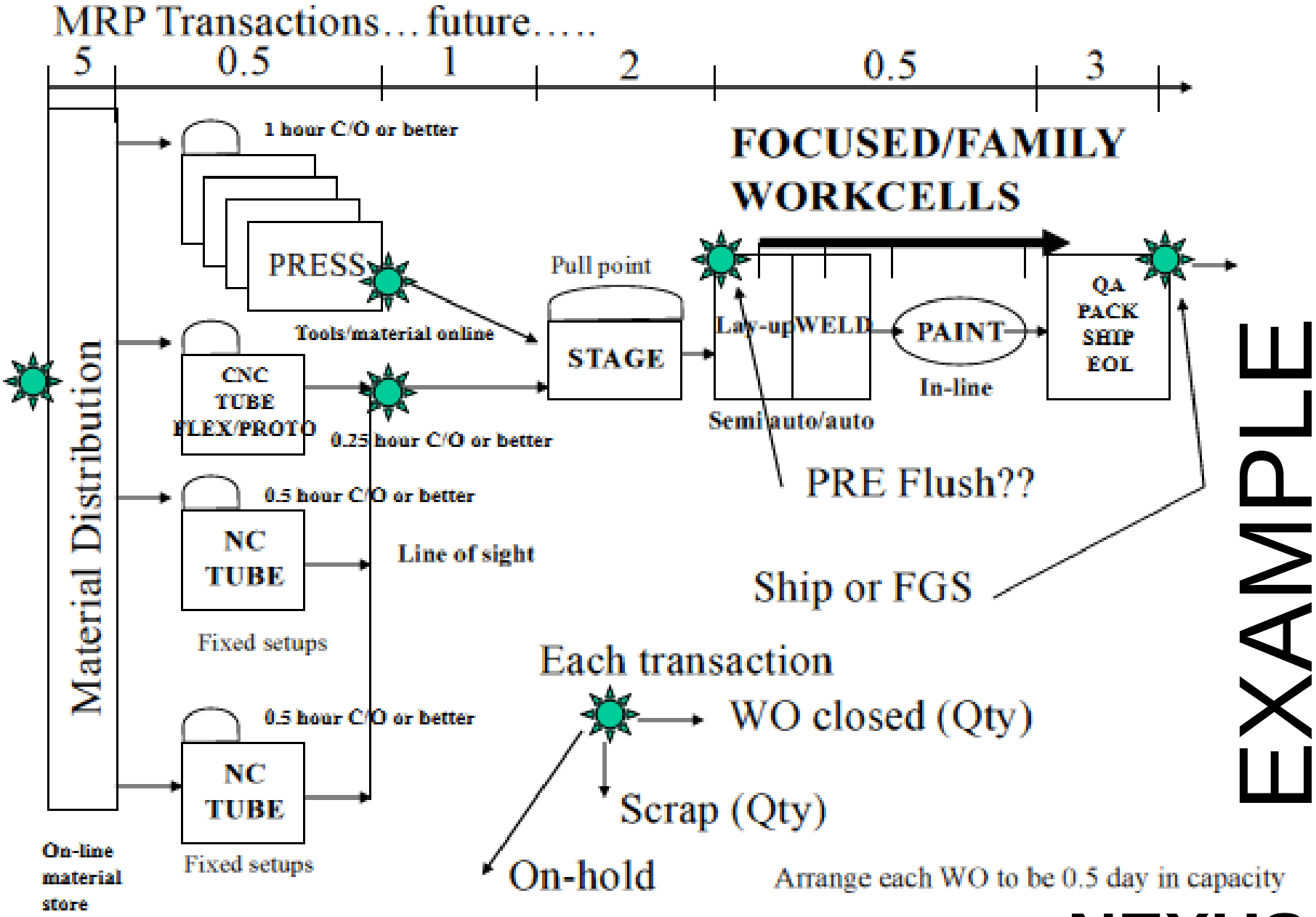
MRP Transactions… future…..
5
0.5
1
2
0.5
3
FOCUSED/FAMILY WORKCELLS
Material Distribution
1 hour C/O or better
PRESS
Tools/material online
Pull point
STAGE
Lay-up
WELD
PAINT
In-line
Semi auto/auto
QA
PACK
SHIP
EOL
CNC TUBE FLEX/PROTO
0.25 hour C/O or better
0.5 hour C/O or better
NC TUBE
Line of sight
Fixed setups
0.5 hour C/O or better
NC TUBE
Fixed setups
On-line material store
PRE Flush??
Ship or FGS
Each transaction
WO closed (Qty)
Scrap (Qty)
On-hold
Arrange each WO to be 0.5 day in capacity
EXAMPLE
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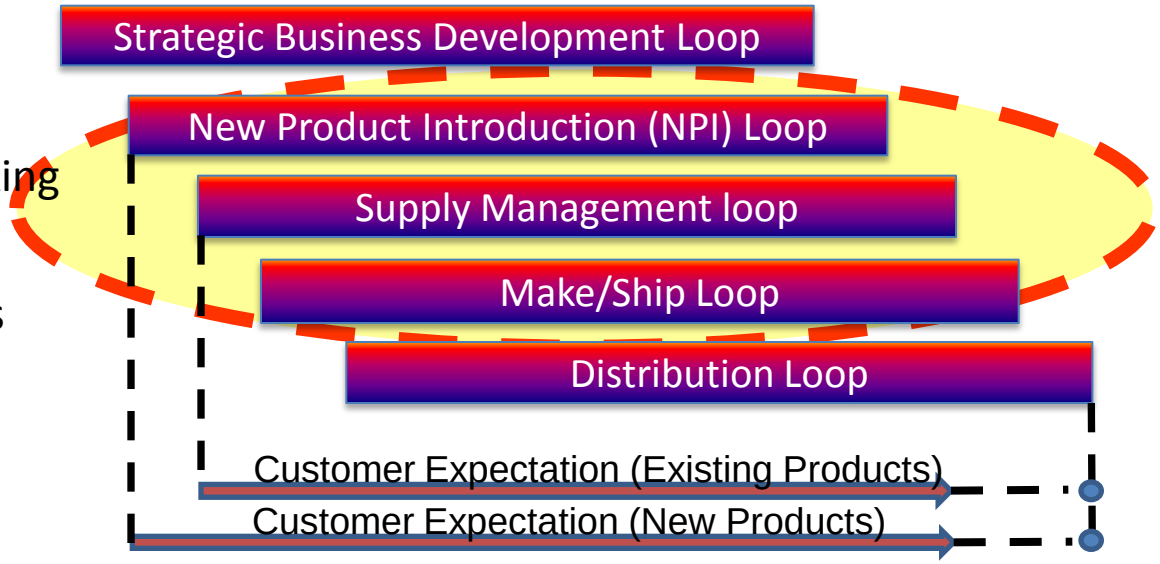
The 5 Cycle Time Loops in any Business

- Who is the customer?
- Must think holistically !
- From Vertical to Horizontal thinking
- The 5 Loops in the business
- Use the 5 Loops to provide focus

5 Business Loops



"Total Cycle Time" …The actual time elapsed from when a customer expresses a need for that product or service, until the time the customer's need is satisfied, and payment is received.

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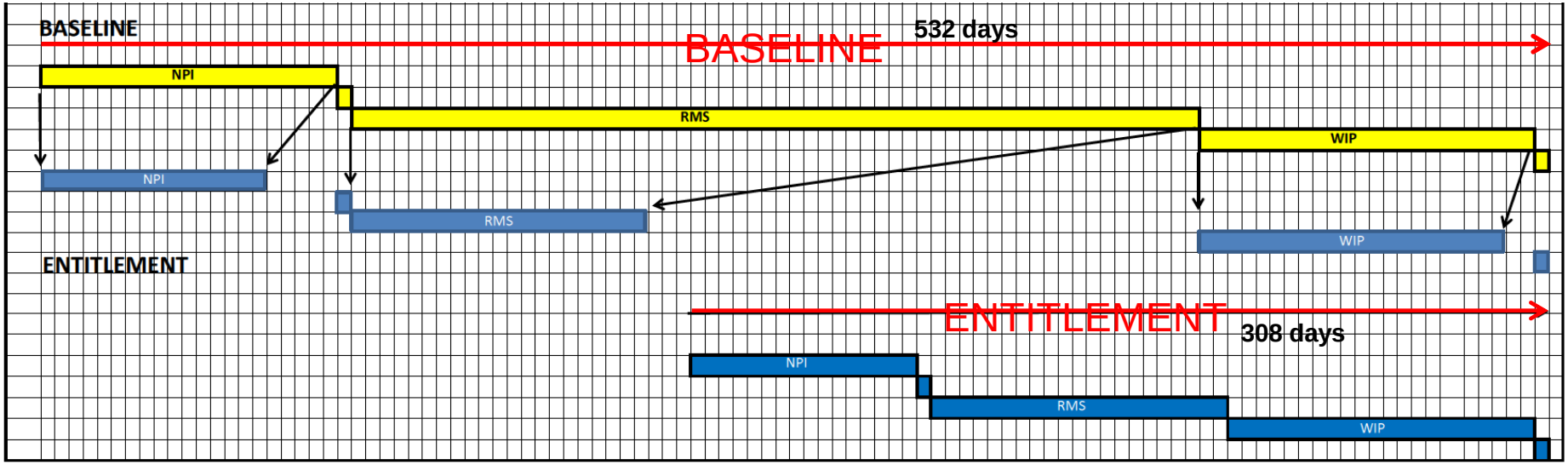
Total Business Cycle-Time chart

EXAMPLE



SAVINGS MODEL

DATA INPUT

estimated	0.00624	Process hours per product average/typical
	24	Hours in day (all shifts)
	250000	Min batch quantity ordered by customers
	105	NPI leadtime (days)
	5	Order entry/sales LT (days)
	84	Supplier leadtime (days)
	302	Inventory of Raw material (days)
process info	115	Manufacturing leadtime or cycletime (days)
LT Days	117	Inventory of work in process (days)
	5	Distribution leadtime (days)
check	0	Inventory in distribution or finnished goods (days)
	60	Customer payment terms (days)

4.8%	Product development as % of product cost
0.0%	Sales effort as % of product cost
18.7%	Materials as % of product cost
8.2%	Direct labor as % of product cost
1.5%	Distribution cost as % of product cost
51.6%	Overhead as % of product cost
15.2%	Cost of Quality as % of product cost
100%	Total COGS Budget

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Savings Model EXAMPLE

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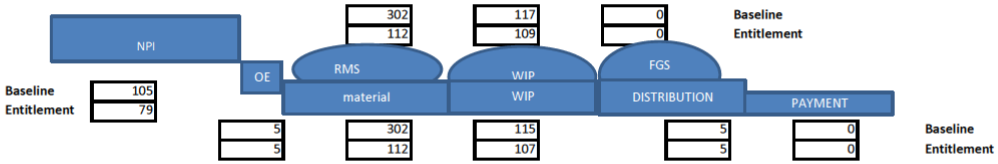
factors		Baseline	Entitlement	Benchmark
Pt in hours	0.00624	0.00624	0.00624	0.00624
Pt improvement		1	0.95	0.9
hours in day	0.00624	24	24	24
process dwell	28.56	28.56	14.28	14.3
min ordered batch size	250000	250000	125000	62500
NPI CT compression		1	0.75	0.5
NPI cost compression		1	0.8	0.75
supplier compression		1	1	0.8
OE compression		1	1	1
cost of sales compression		1	1	1
Overhead compression		1	0.9	0.75
COQ compression		1	0.9	0.8
make compression Pt linear factor		0	3	3
make batch setup reduction		1	0.5	0.25
supply batch reduction		1	1	1
planning cycle days		5	5	5

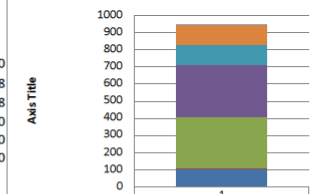
BUSINESS PROCESS (DAYS)



DATA		% saved	Baseline	Entitlement	Benchmark	
NPI LT in days	105	25	105	78.75	52.5	
OE/sales LT	5	0	5	5	5	
Supply LT in days	301.77165	63	302	111.9	111.9	
Days of RMS	301.77165	63	302	111.9	63.2	190
Manufacturing CT in days	115	7	115.0	106.9	58.2	8
Days of WIP	117	7	117.0	108.9	58.2	8
Distribution LT in days	5	0	5	5	5	0
Days of FGS	0		0	0	0	0
Payment CT	0		0	0	0	0
TOTAL CT	**950.5**	**44.4**	**950.5**	**528.4**	**353.9**	
Product development % cost	4.77	20	4.77	3.82	3.58	1
Cost of sales %	0		0	0	0	0
Material as % of products cost	18.73	0	18.73	18.73	18.73	0
Labour as % of product cost	8.22	5	8.22	7.81	7.40	0
Cost of distribution	1.49	0	1.49	1.49	1.49	0
Overhead as % of product cost	51.63	10	51.63	46.46	38.72	5
Cost of quality	15.16	10	15.16	13.64	12.13	2
Total cost	**100.00**	**8**	**100.00**	**91.96**	**82.05**	8
Total inventory days			419	221	121	
Inventory days saved			0	198	297	
RMS $ inventory		provided	10500000	3893724	2197491	
WIP $ inventory		estimate	62902732	58551288	31810322	
Total RIP inventory $			73402732	62445012	34007813	

CYCLE TIME DAYS

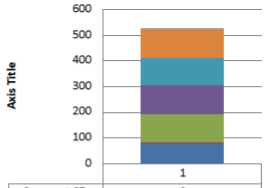
BASELINE



	1
Payment CT	0
Days of FGS	0
Distribution LT in days	5
Days of WIP	117
Manufacturing CT in days	115
Days of RMS	301.7716535
Supply LT in days	301.7716535
OE/sales LT	5
NPI LT in days	105

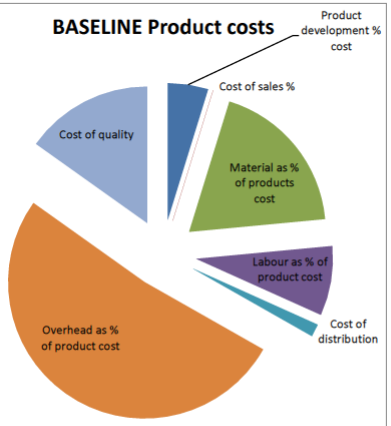
CYCLE TIME DAYS

ENTITLEMENT



	1
Payment CT	0
Days of FGS	0
Distribution LT in days	5
Days of WIP	108.9
Manufacturing CT in days	106.9
Days of RMS	111.9
Supply LT in days	111.9
OE/sales LT	5
NPI LT in days	78.75

BASELINE Product costs

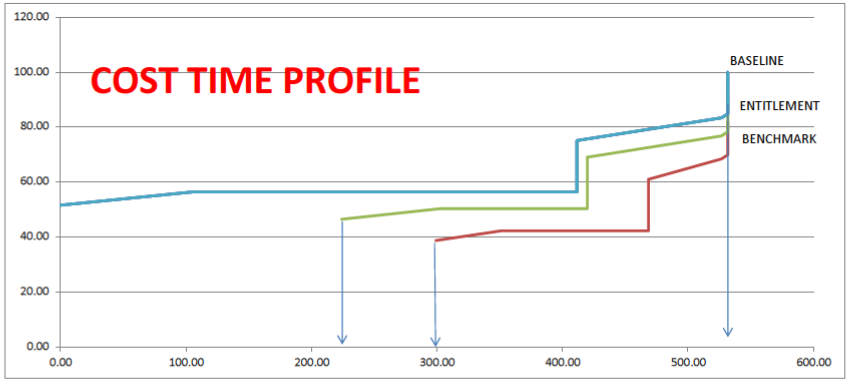


Savings	%	Saved $K	*Baseline*	*Entitlement*	*Benchmark*
Product development % cost	0.95	1360000	0	0.95	1.19
Cost of sales %	0.00	0	0	0.00	0.00
Material as % of products cost	0.00	0	0	0.00	0.00
Labour as % of product cost	0.21	292823	0	0.21	0.82
Cost of distribution	0.00	0	0	0.00	0.00
Overhead as % of product cost	5.16	7355340	0	5.16	12.91
Cost of Poor Quality	1.52	2159470	0	1.52	3.03
Total Product %	7.84	**11167633**		**7.84**	**17.95**

50% of labor savings due to seasonal business

COGS $ **142472000**

	Baseline	*Entitlement*	*Benchmark*
recuring savings	0	11,167,633	25,578,580
non recuring savings	0	10,957,720	39,394,919
total savings 1st year	0	**22,125,353**	**64,973,499**
% saved		**15.53%**	**45.60%**
% year 2		**7.84%**	**17.95%**



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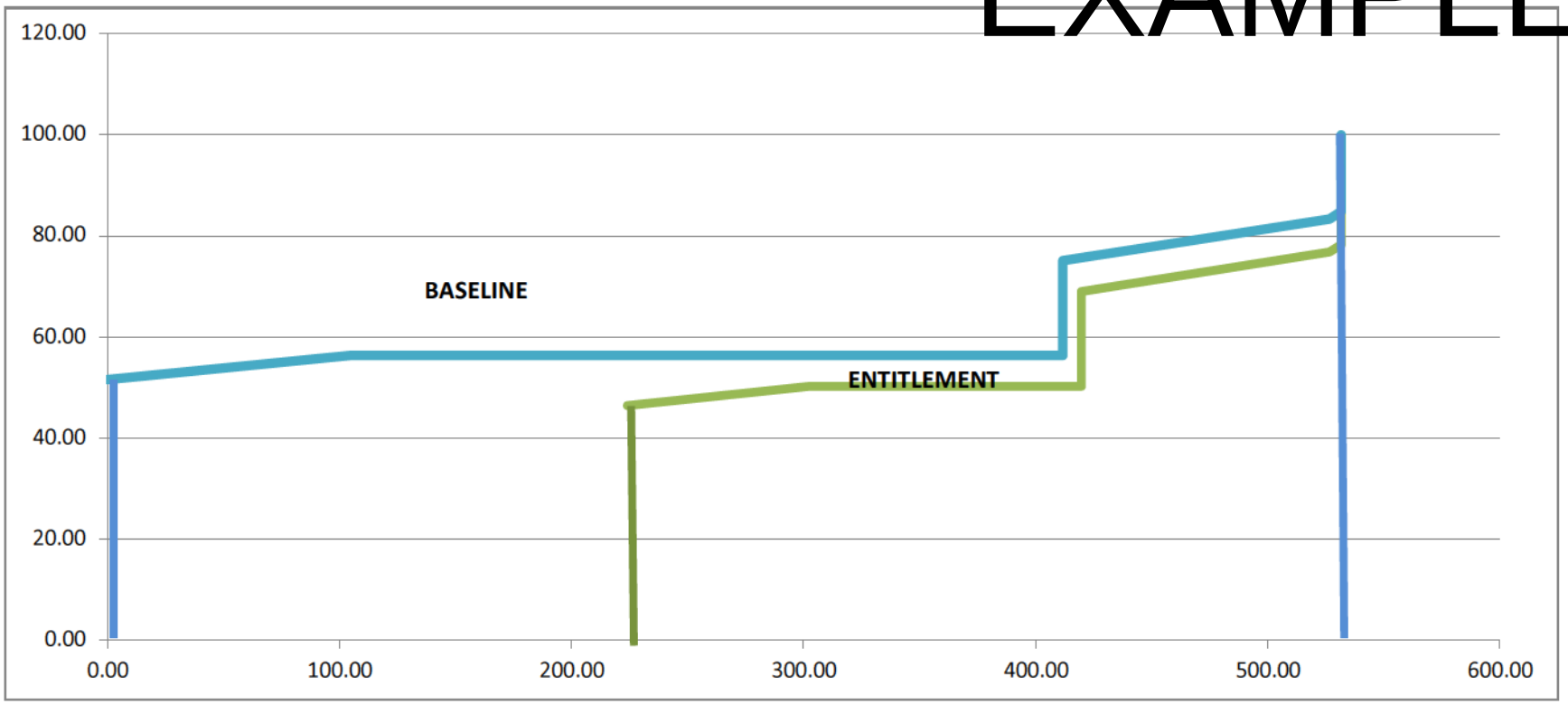
COST TIME PROFILE

EXAMPLE



Cost Time Map	Baseline CT	Baseline cost %	Baseline CT cum	Baseline cost % cum	Entitle CT	Entitle cost %	Entitle CT cum	Entitle CT ADJUST	Entitle cost % cum	Bench CT	Bench cost %	Bench CT cum	Bench CT ADJUST	Bench cost % cum
overhead	0.00	51.63	0.00	51.63	0.00	46.46	0.00	224.21	46.46	0.00	38.72	0.00	299.21	38.72
NPI loop CT	105.00	4.77	105.00	56.40	78.75	3.82	78.75	302.96	50.28	52.50	3.58	52.50	351.71	42.30
OE time	5.00	0.00	110.00	56.40	5.00	0.00	83.75	307.96	50.28	5.00	0.00	57.50	356.71	42.30
supply LT	301.77	0.00	411.77	56.40	111.91	0.00	195.66	419.87	50.28	111.91	0.00	169.41	468.62	42.30
supply inventory	0.00	18.73	411.77	75.13	0.00	18.73	195.66	419.87	69.01	0.00	18.73	169.41	468.62	61.03
make CT	115.00	8.22	526.77	83.35	106.91	7.81	302.56	526.77	76.82	58.16	7.40	227.56	526.77	68.43
make inventory	0.00	0.00	526.77	83.35	0.00	0.00	302.56	526.77	76.82	0.00	0.00	227.56	526.77	68.43
distribution	5.00	1.49	531.77	84.84	5.00	1.49	307.56	531.77	78.31	5.00	1.49	232.56	531.77	69.92
FGS inventory	0.00	0.00	531.77	84.84	0.00	0.00	307.56	531.77	78.31	0.00	0.00	232.56	531.77	69.92
COQ	0.00	15.16	531.77	100.00	0.00	13.64	307.56	531.77	91.96	0.00	12.13	232.56	531.77	82.05
payment	0.00	0.00	531.77	100.00	0.00	0.00	307.56	531.77	91.96	0.00	0.00	232.56	531.77	82.05
	531.77165	100			**308**	91.95599				**232.5625**	82.04[illegible]9			

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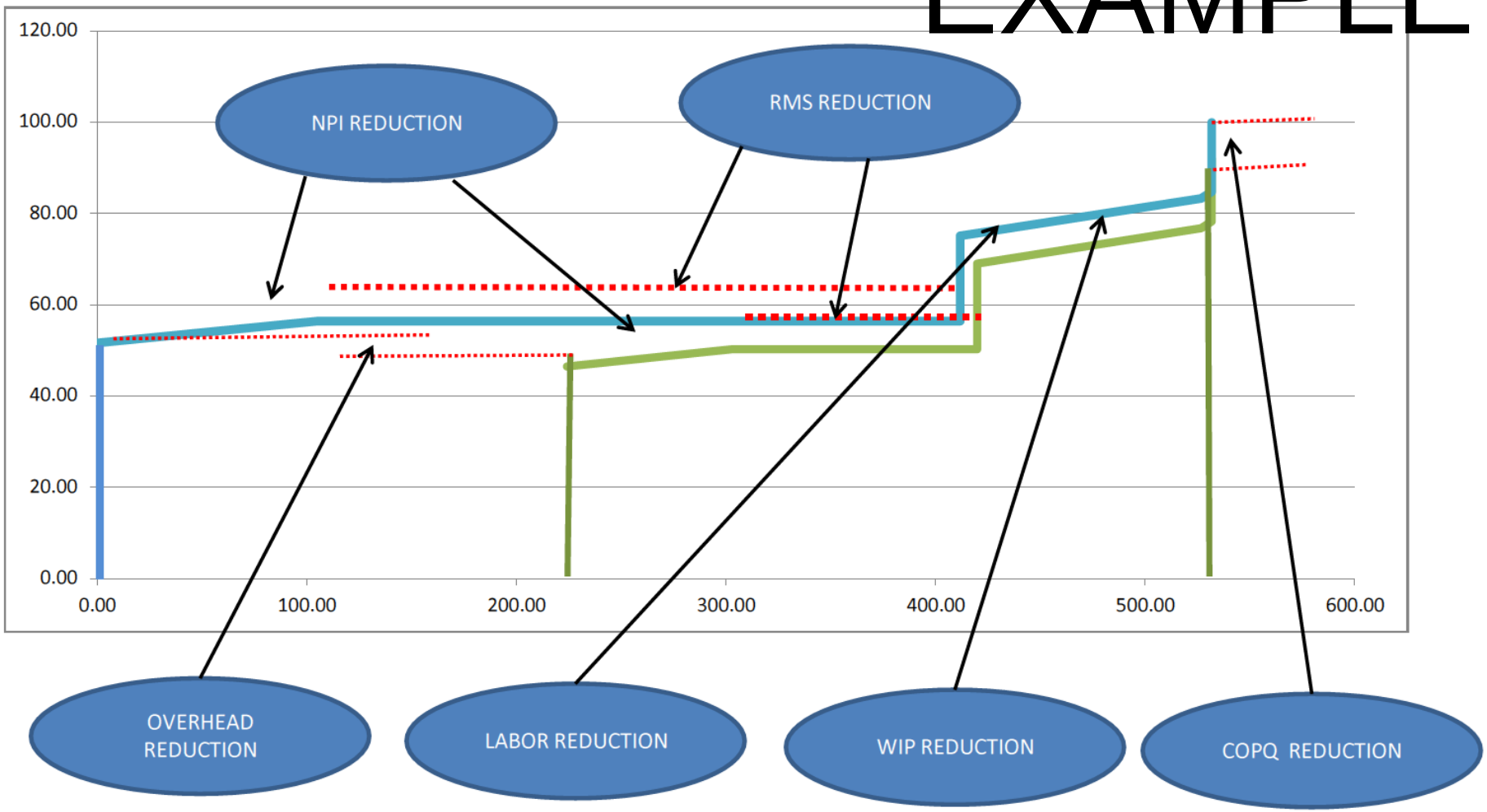
COST TIME PROFILE

EXAMPLE



NEXUS

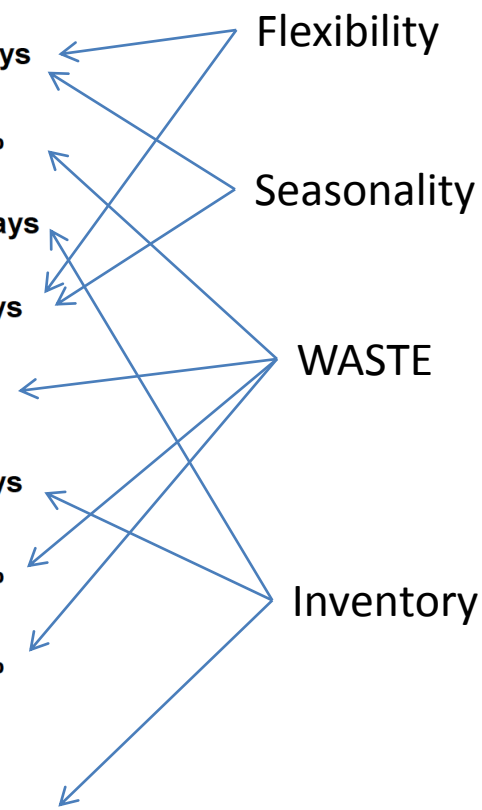
EXAMPLE

Savings Model Extract

Typical SAVINGS SUMMARY

SUMMARY

DATA	Baseline	Entitlement	% saved	Savings
NPI LT in days	105.00	78.75	25 %	26 Days
Product development % cost	4.77	3.82	20 %	20%
Days of RMS	301.77	111.91	63 %	190 Days
Manufacturing CT in days	115.00	106.91	7 %	8 Days
Labour as % of product cost	8.22	7.81	5 %	5%
Days of WIP	117.00	108.91	7 %	8 Days
Overhead as % of product cost	51.63	46.46	10 %	10%
Cost of quality	15.16	13.64	10 %	10%
Total cost	100.00	91.96	8 %	8%
Total inventory days	419	221	47 %	198 Days
Total RIP inventory $	73402732	62445012	15 %	$10.9M
COGS $	142472000	131011545	8 %	$11.4M



NEXUS

LEAN-ing Toward Success…

The 6 Step Approach

1/ Get Help/Learn the tools

2/ Develop your vision

3/ Build your Evolution plan

4/ Start making changes via projects

5/ Get some successes

6/ And keep it going

NEXUS

Build the Evolution plan

- Define a good baseline
- Define the entitlement
- Define the gap
- Define the projects that must close that gap
- Approach to take..
  - If its waste eliminate it….as mush as possible
  - If its non value adding……eliminate… (keep separating to strip out Non Value adding)
  - If not possible to eliminate ….try to combine steps or activities
  - Reduce complexity
  - Eliminate transactions and people involved
  - Add technology or capital as a last resort
  - ensure it IMPROVES customer satisfaction
  - Record all ideas how ever crazy..
  - Be prepared to be surprised!

NEXUS

Build the Evolution plan (continued)

Structure the projects into 3 Tiers

Tier 1 Strategic level/organizational changes

Tier 2 Improvement projects (2 types)

» Process performance projects

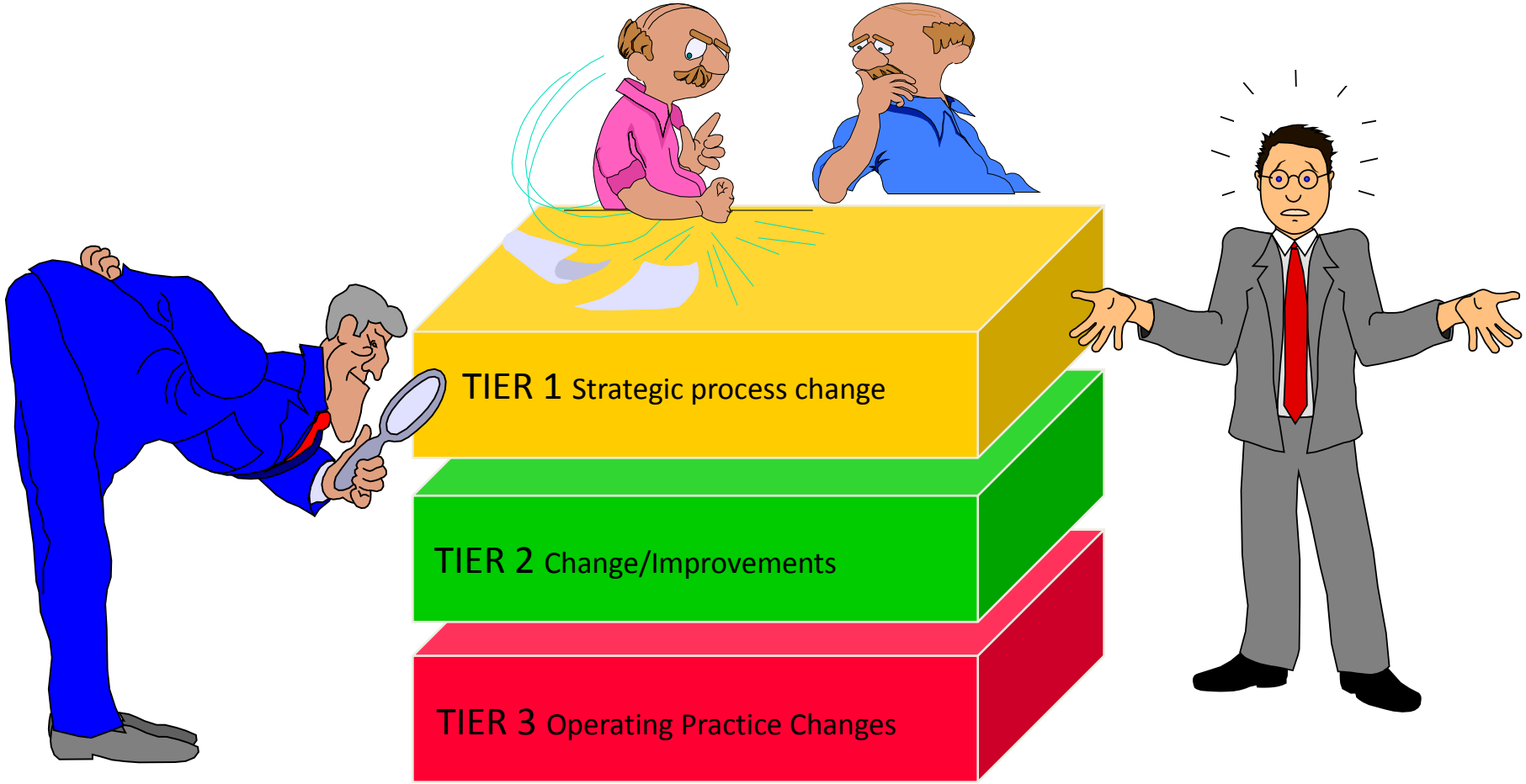
» Process change projects

Tier 3 Detailed operating practice changes

- Record list and prioritize these projects to implement them in a controlled way.

NEXUS

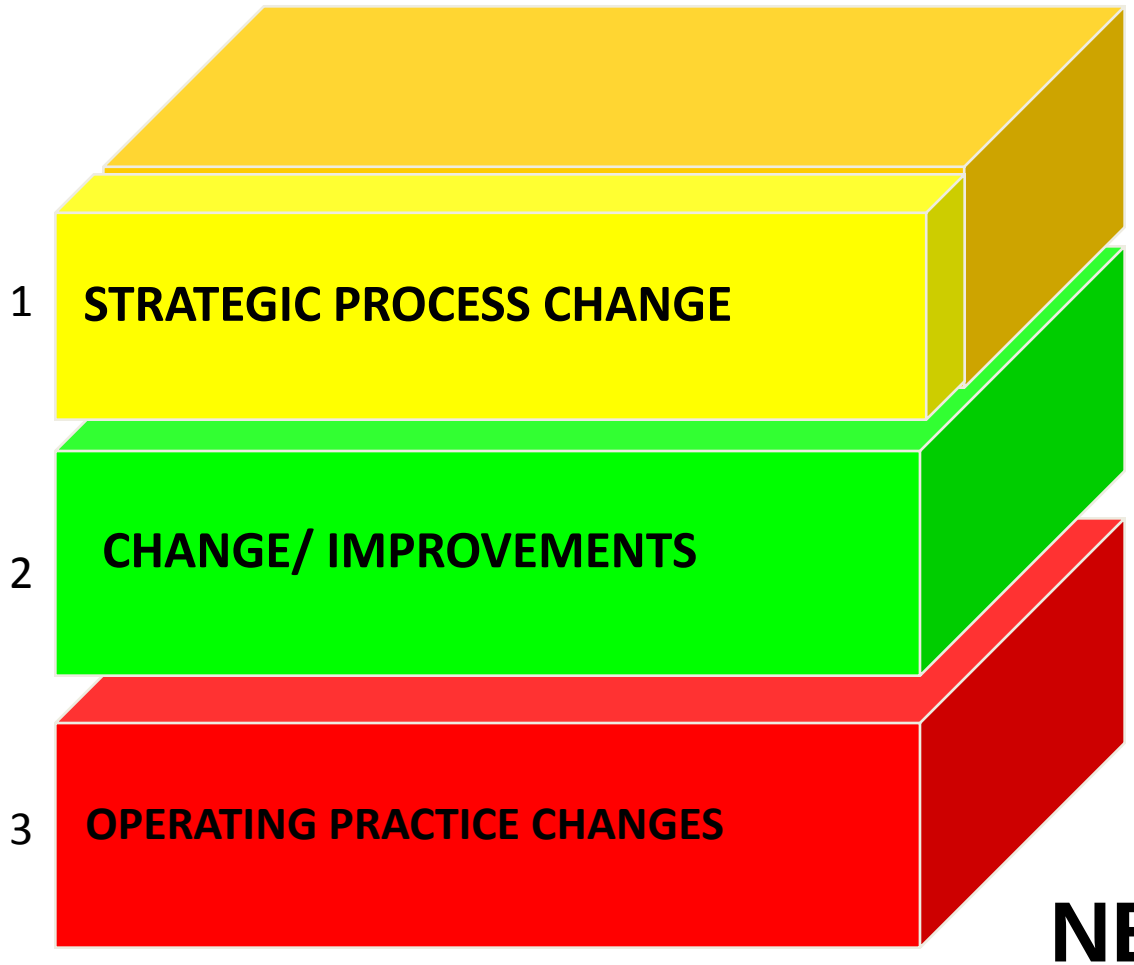
3 TIER APPROACH TO CHANGE



HOW DOES YOUR ORGANIZATION STACK UP?

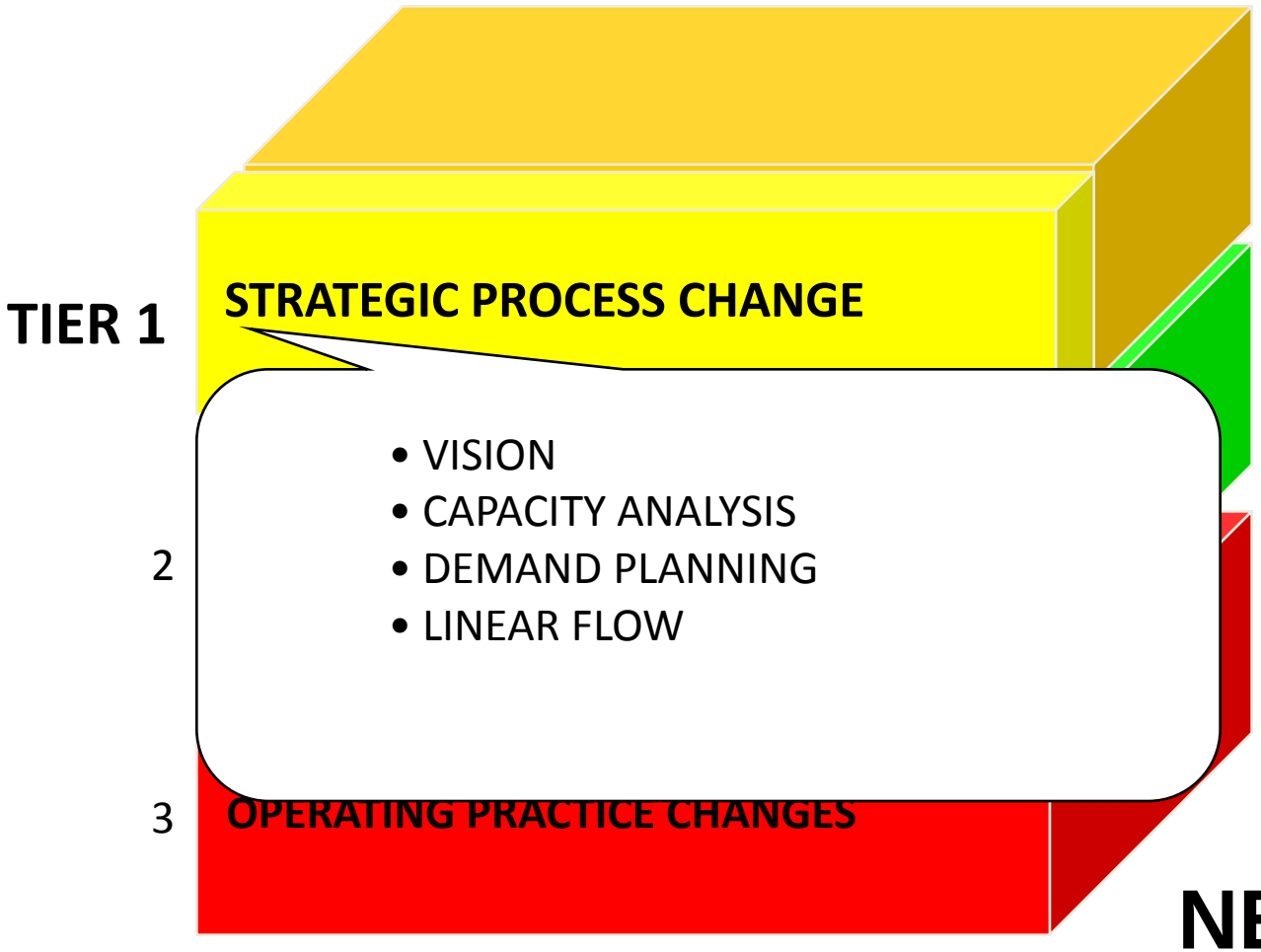
NEXUS

3 TIER APPROACH TO CHANGE



NEXUS

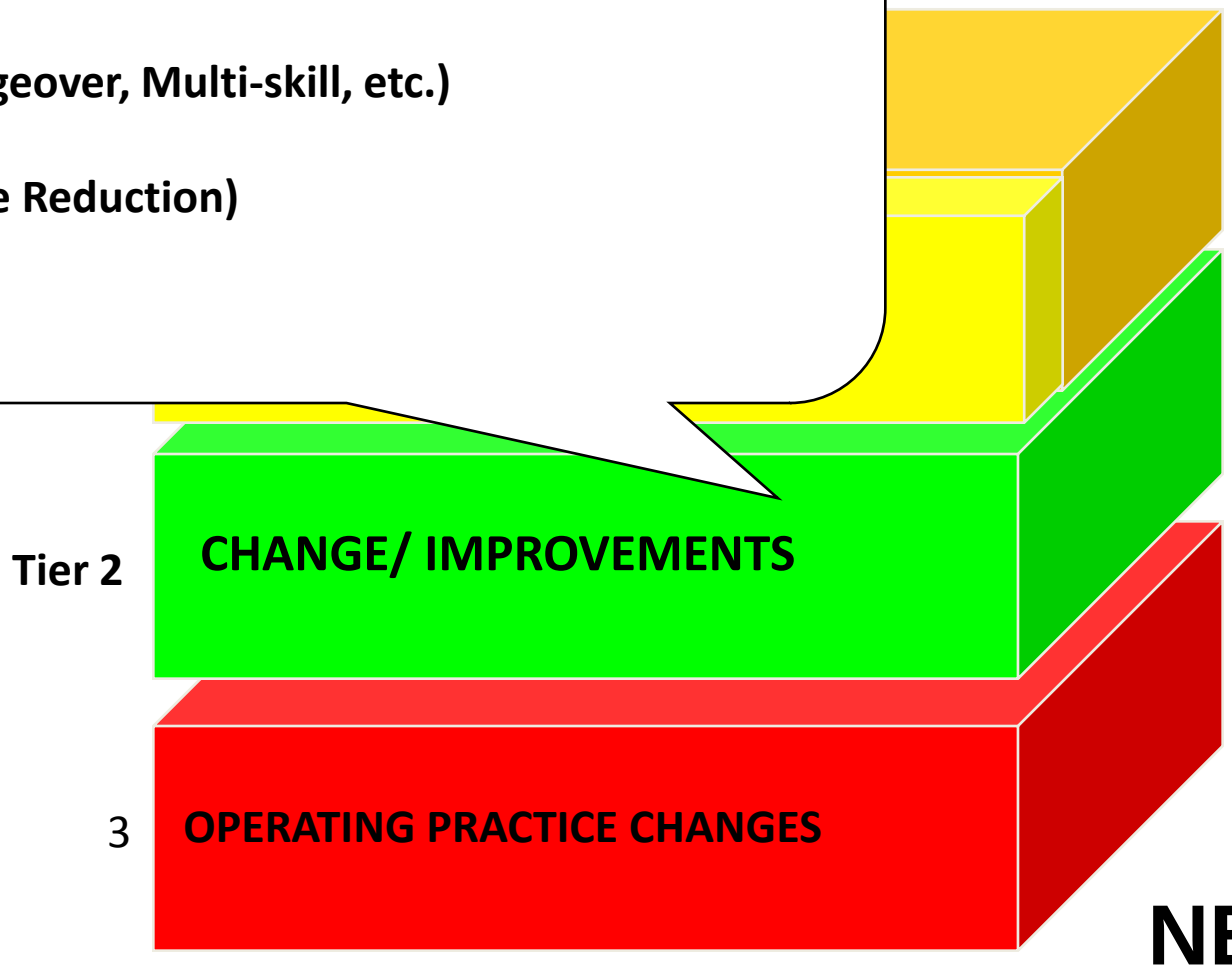
3 TIER APPROACH TO CHANGE



NEXUS

3 TIER APPROACH TO CHANGE

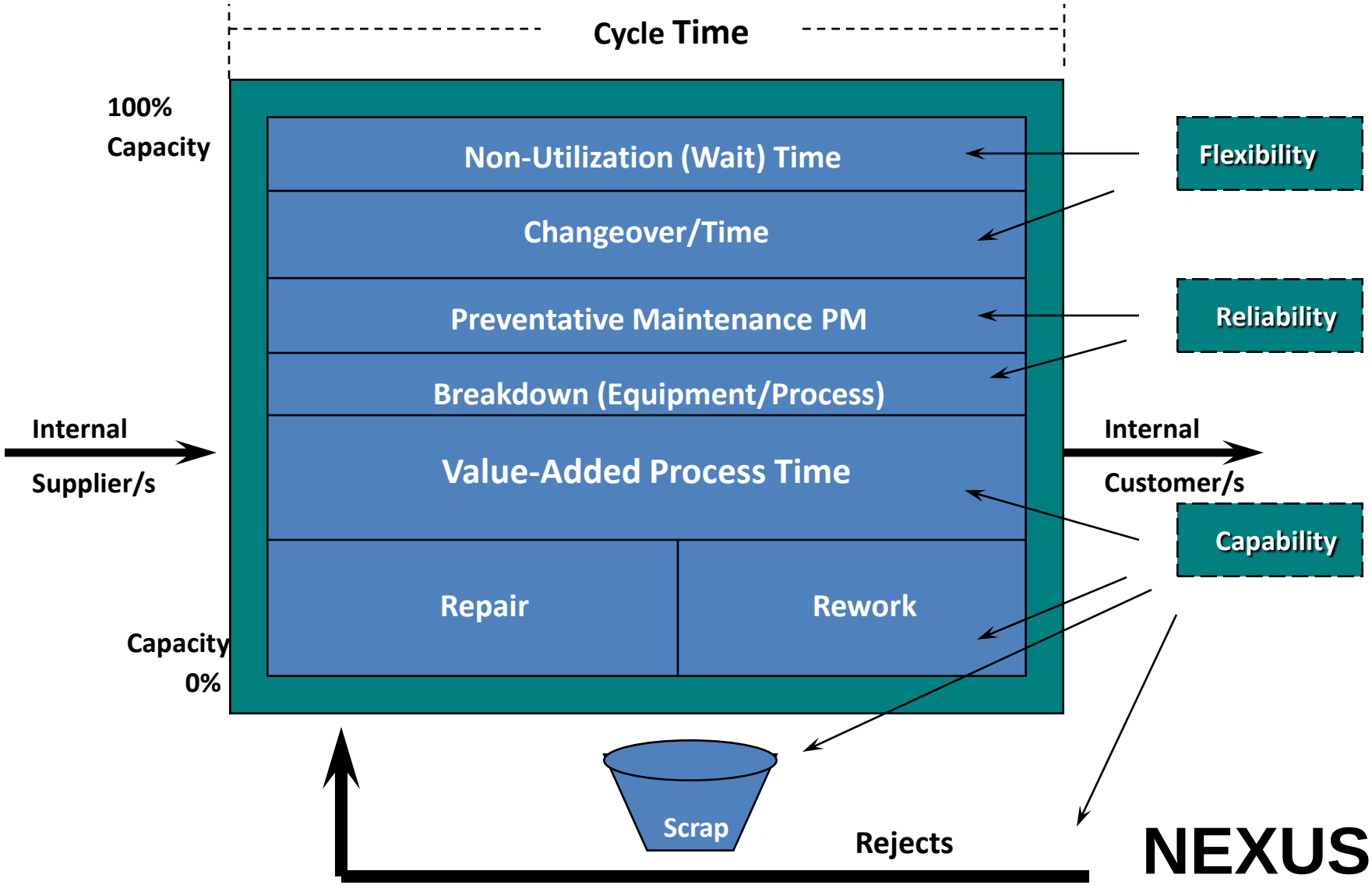
- RELIABILITY (TPM, SPC, etc.)
- FLEXIBILITY (Changeover, Multi-skill, etc.)
- CAPABILITY (Waste Reduction)



NEXUS

Typical Process Step

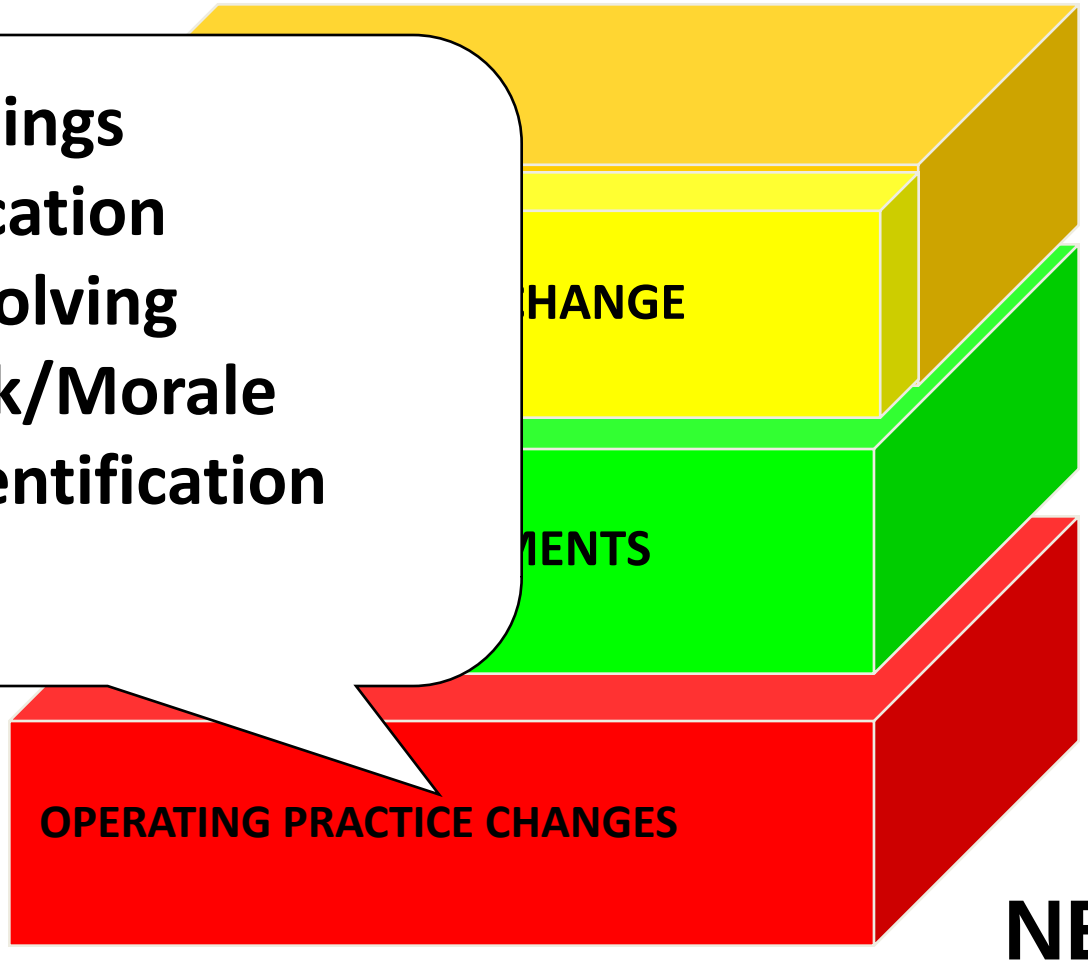
(Performance Model)



3 TIER APPROACH TO CHANGE

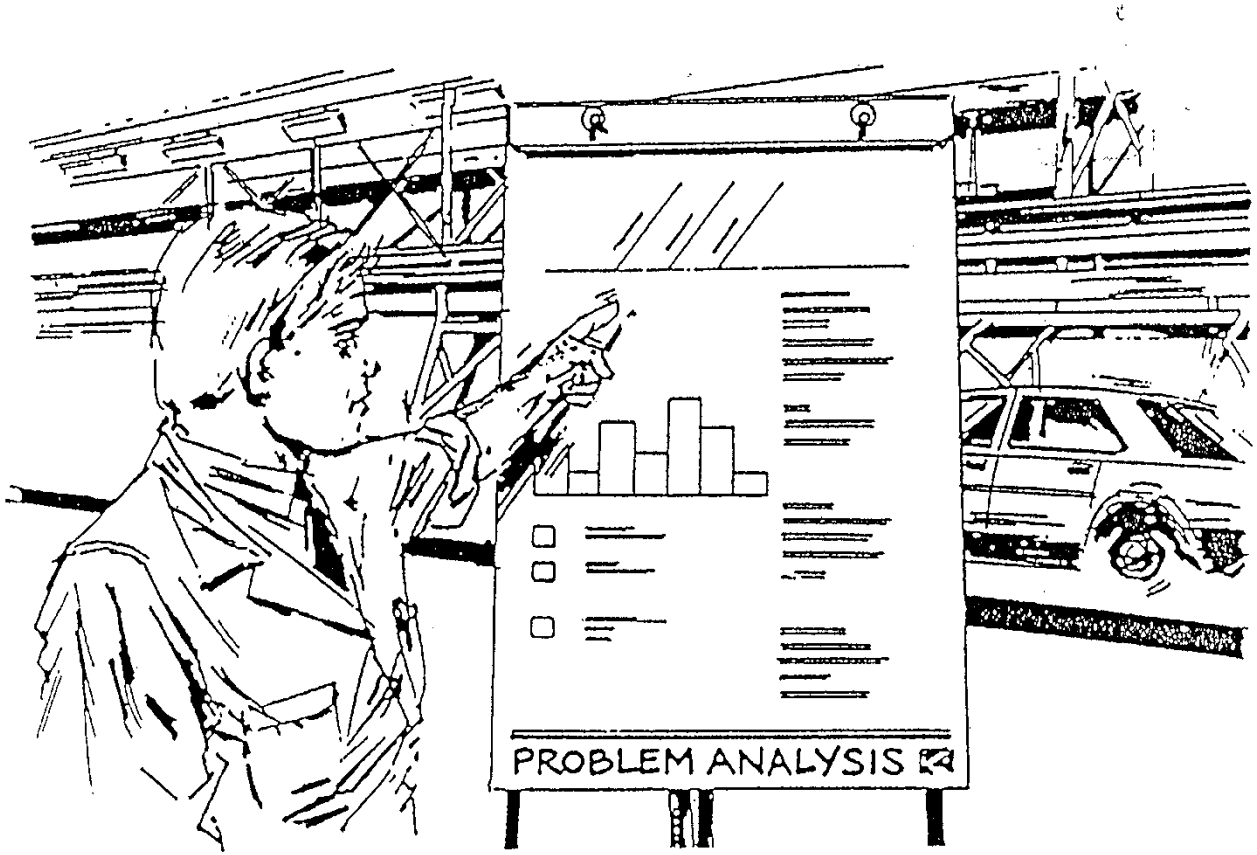
Stand-up Meetings

- Point Meetings
- Communication
- Problem Solving
- Team-work/Morale
- Project Identification



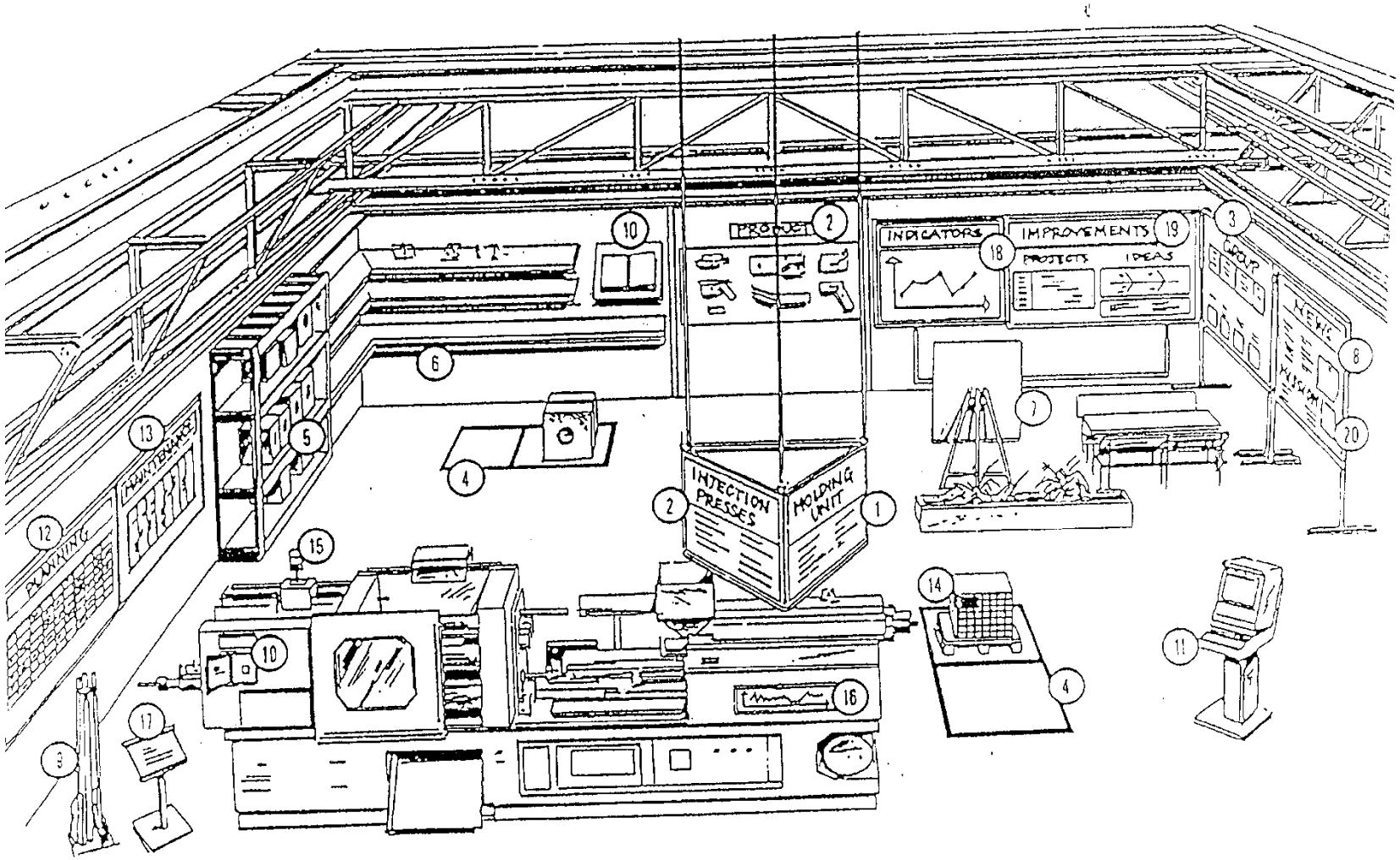
NEXUS

POINT MEETINGS…….. TIER 3 core tool



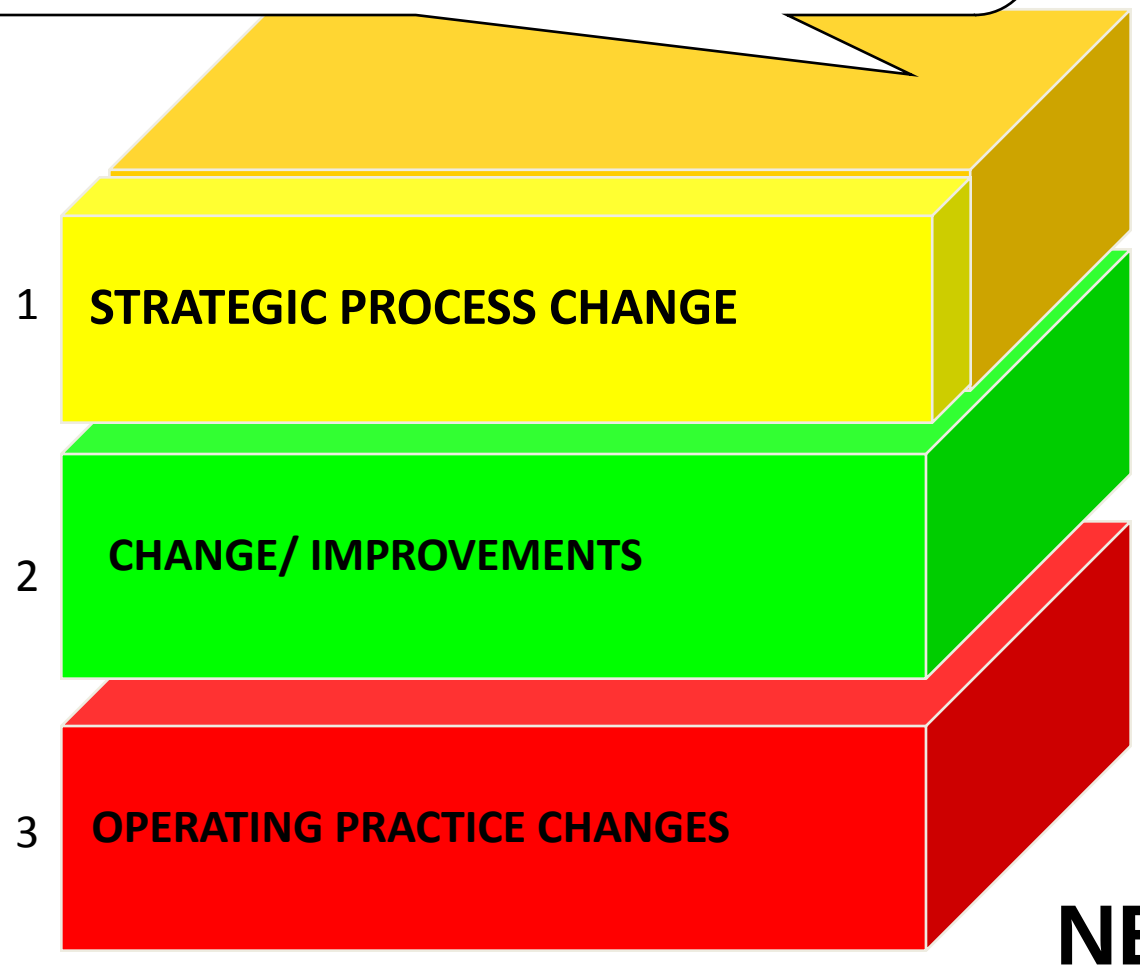
NEXUS

The Visual Factory



NEXUS

- ORGANIZATIONAL ALIGNMENT
- PROCESS/PRODUCT/MARKET ALIGNMENT
- PLANT LAYOUT
- PULL SYSTEM IMPLEMENTATION



NEXUS

LEAN-ing Toward Success…

The 6 Step Approach

1/ Get Help/Learn the tools

2/ Develop your vision

3/ Build your Evolution plan

4/ Start making changes via projects

5/ Get some successes

6/ And keep it going

NEXUS

Start making changes via projects

- List all projects into an Evolution plan
- Use the 5 loop/3 tier structure
- Prioritize projects by progress rate and payback.
- Only activate projects that can be resourced.
- Ensure scope and mandate of projects is defined
- Define a project leader and monitor progress.

LEAN-ing Toward Success…

The 6 Step Approach

1/ Get Help/Learn the tools

2/ Develop your vision

3/ Build your Evolution plan

4/ Start making changes via projects

5/ Get some successes

6/ And keep it going

NEXUS

Get some successes

- Senior management must review project activation and progress
- Ensure all people involved in the projects have the vision and are trained and briefed fully.
- Ensure project implementation is a positive and motivating experience.. Make the changes a win for every-one.
- Try to avoid early staff cuts and work hard to minimize these.
- Remember success motivates the next efforts!

LEAN-ing Toward Success…

The 6 Step Approach

1/ Get Help/Learn the tools

2/ Develop your vision

3/ Build your Evolution plan

4/ Start making changes via projects

5/ Get some successes

6/ And keep it going

NEXUS

And.. Keep it going!

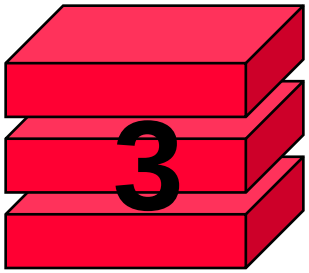
- Regular Evolution plan review meeting to sustain progress.
- Ensure the LEAN tools are taught and used continuously.
- Review the roles of <u>everyone</u> as the organization evolves..
- Modern supervisory practices
- Daily Communication and Point Meetings
- Effective and real-time performance measurement
- Strong tools to problem-solve and motivate
- Project and Change management tools

Checklist for a Good Improvement journey

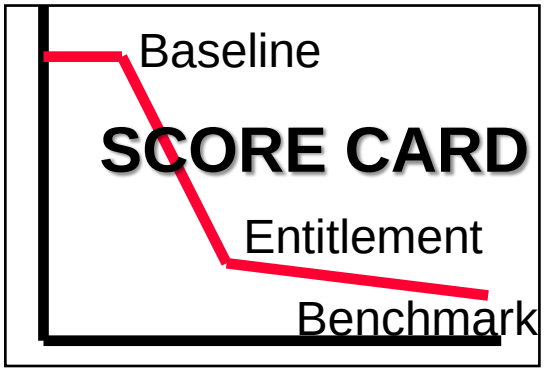
- Don’t become satisfied with profits!
- Think ….it’s YOUR business!
- Get the Tools and know-how
- Hold a clear vision and believe it!
- Always have an Evolution plan
- Know where the opportunities are and stay focused on them
- Measure , benchmark and report the journey
- Use cross functional Project teams and focus key resources
- Organize and involve everyone for that journey
- Sustain progress with good operating practices
- HAVE..Fun!!!

NEXUS

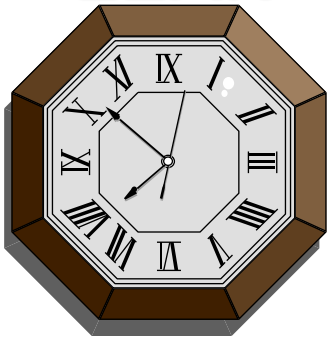
5 CYCLE-TIME Loops in a business



3 TIERS for Change

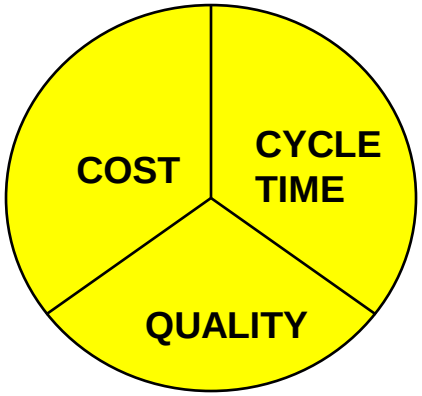


LEAN



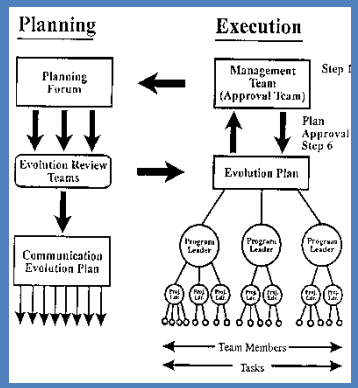
CYCLE TIME

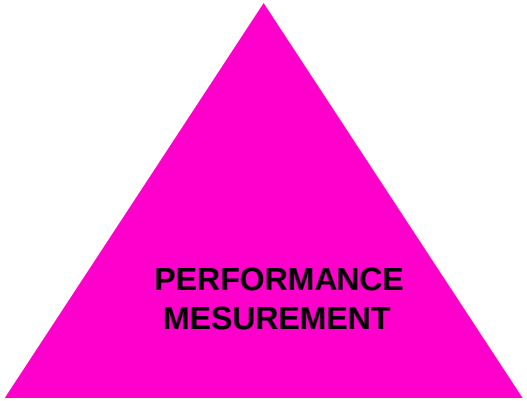
Continuous

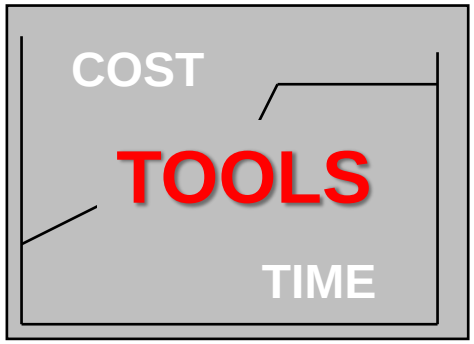


Improvement

IMPLEMENTATION







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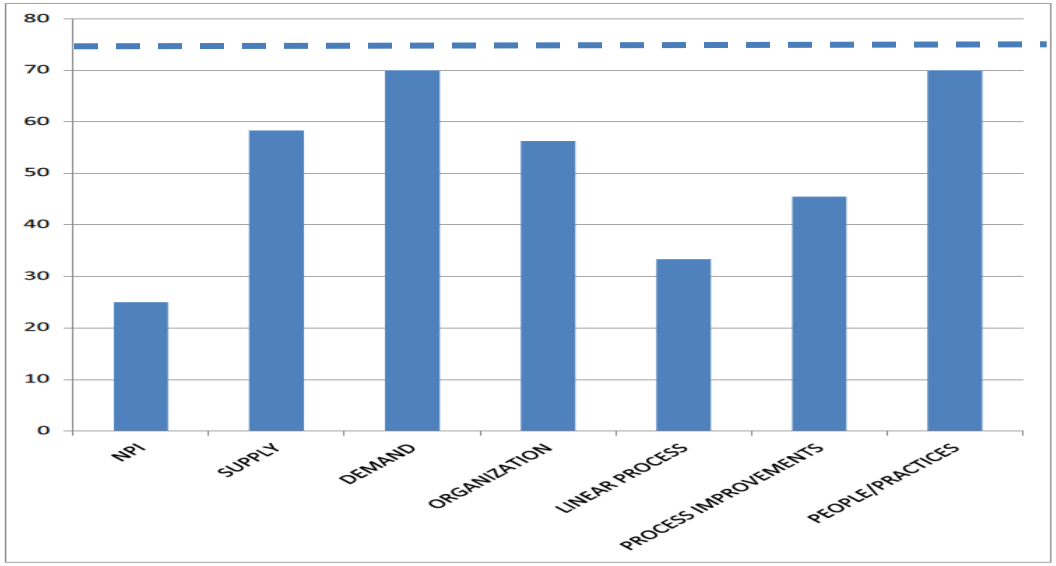
Society of Manufacturing Engineers Toronto
Advancing Manufacturing in Ontario

Benchmark your LEAN journey

THE SCORE CARD



Available to SME Chapter Members

LEAN CERTIFICATION

Society of Manufacturing Engineers

Why is LEAN so difficult?

It's a journey as well as a goal …

Need to keep looking…

Where we have been

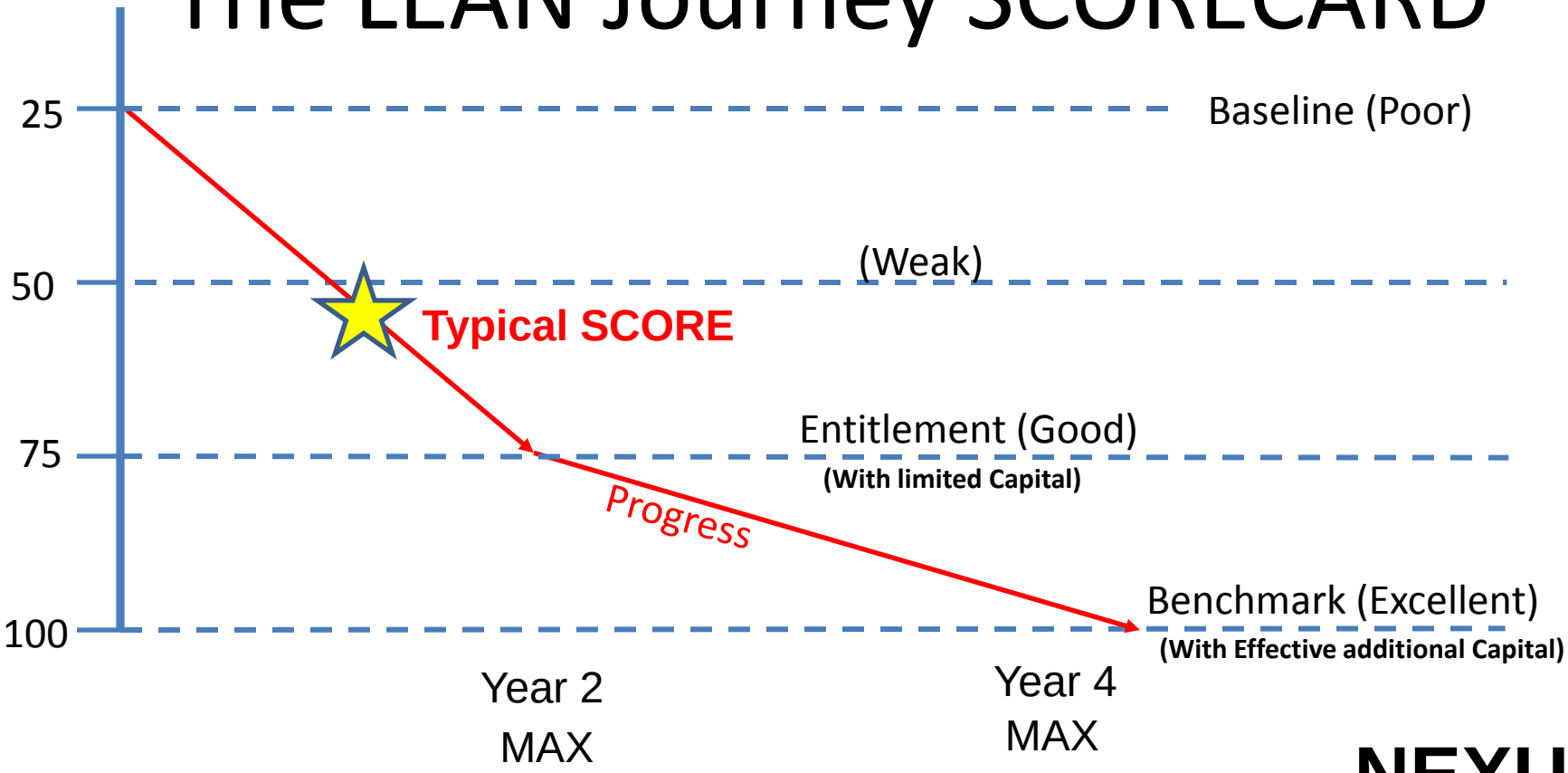
Where we are now

Where we are going

Are we there yet??

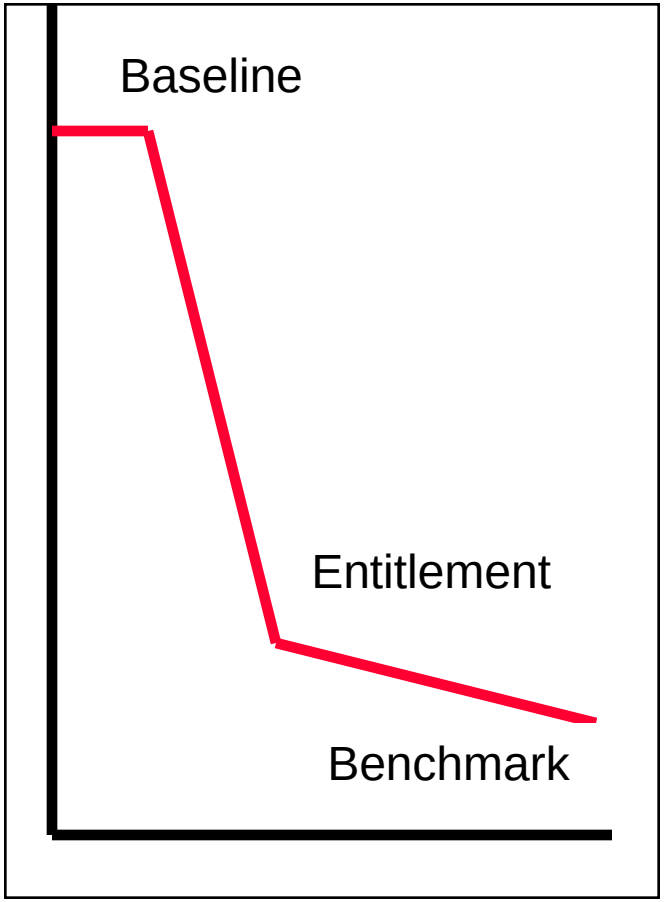
NEXUS

The LEAN Journey SCORECARD



NEXUS

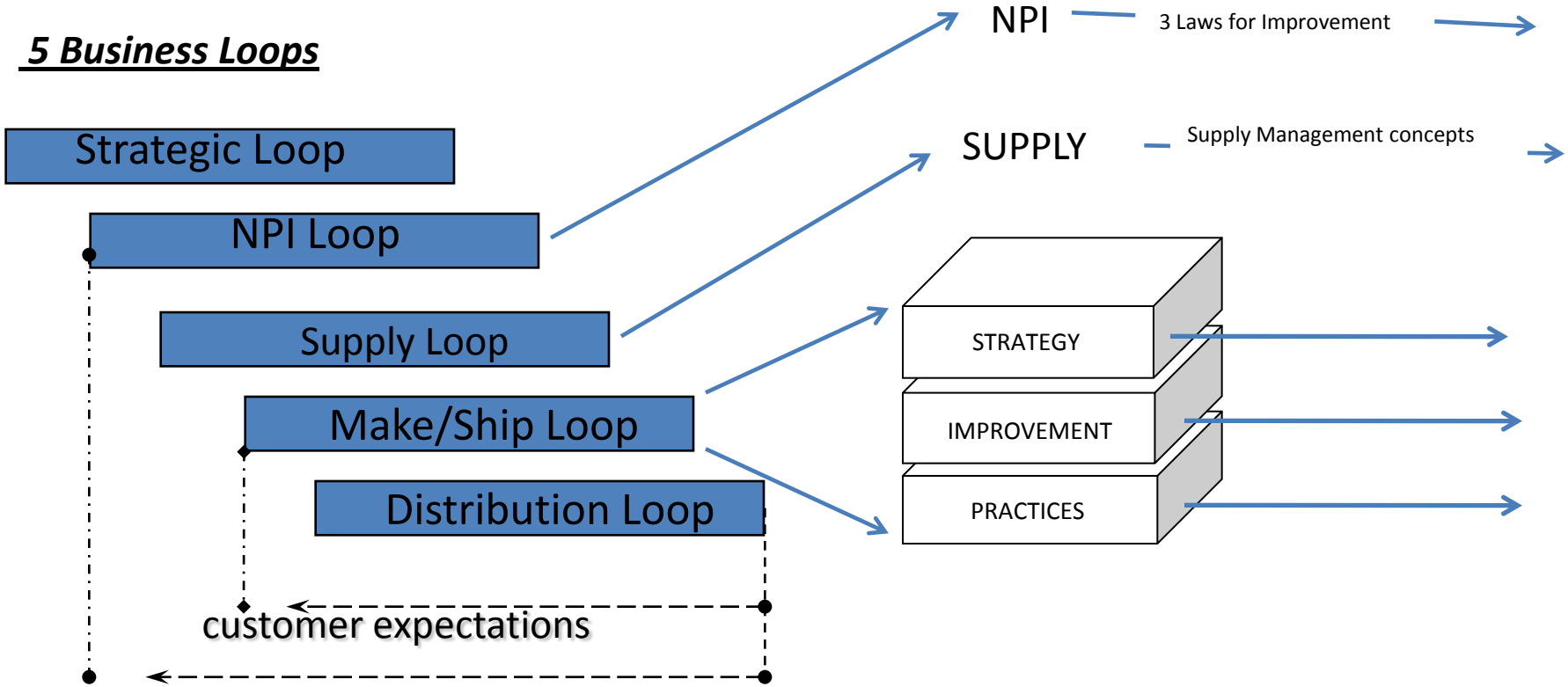
Measurement of Performance



- **Baseline:** Current performance
- **Entitlement:** Level of performance achieved with present resources & capital
- **Benchmark:** Best competitive performance with added resources and technology

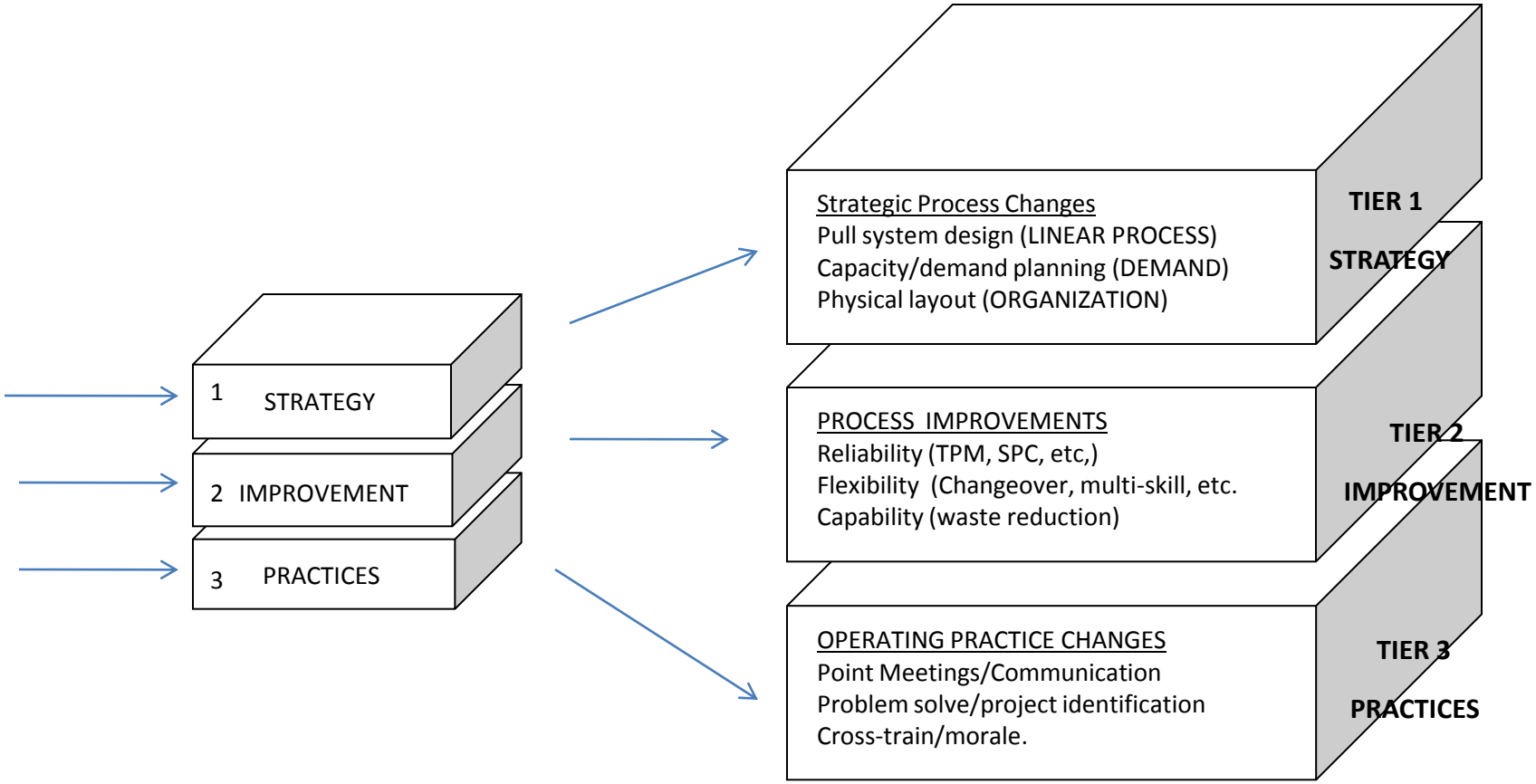
NEXUS

LEAN BUSINESS ENVIRONMENT



NEXUS

LEAN BUSINESS ENVIRONMENT



NEXUS

LEAN Scorecard Categories

NPI

SUPPLY

TIER 1

- DEMAND
- ORGANIZATION
- LINEAR PROCESS

TIER 2 PROCESS IMPROVEMENTS

TIER 3 PEOPLE/PRACTICES

NEXUS

The questions never change…..

……Just the answers

Einstein

EXPLANATION OF QUESTIONS/Answers

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Typical LEAN SCORE

NPI	25%
Supply	58%
Demand	70%
Organization	56%
Linear Process	33%
Process Improvement	45%
People/Practices	70%

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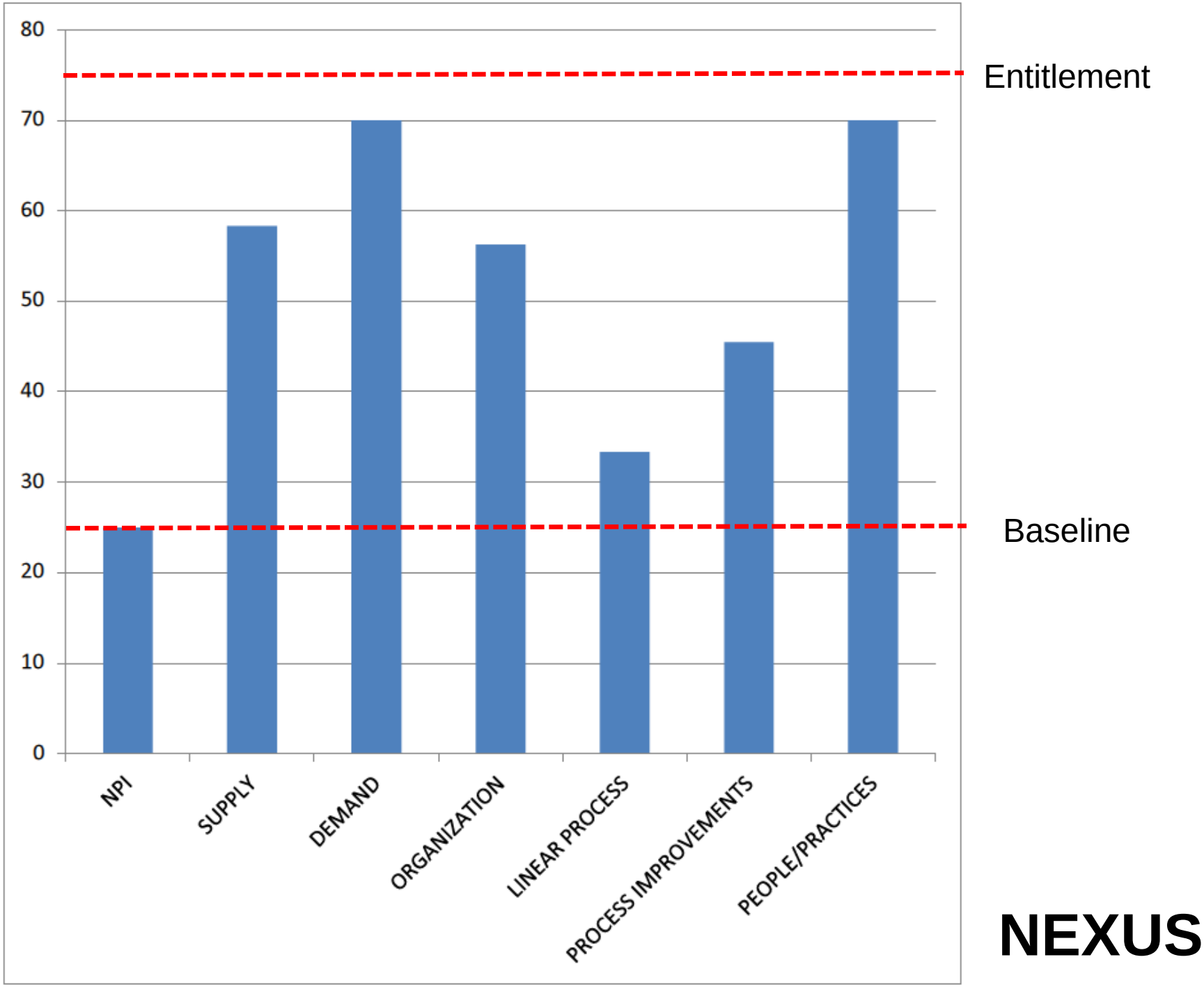
80
70
60
50
40
30
20
10
0
Entitlement
Baseline
NPI
SUPPLY
DEMAND
ORGANIZATION
LINEAR PROCESS
PROCESS IMPROVEMENTS
PEOPLE/PRACTICES
NEXUS

LEAN SCORE TYPICAL

NPI	25%
Supply	57%
Demand	70%
Organization	55%
Linear Process	30%
Process Improvement	45%
People/Practices	70%

Average 50% Weak (Baseline plus)

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Advancing Manufacturing in Ontario

www.SME-TBM.org

Take Back Manufacturing

HOME | Its Time to Take Back Manufacturing | The TBM Initiative | TBM Survey Instructions | Special Notice to Members | NEWS
TBM Press Release Information | TBM Mission | The TBM Forum | TBM Forum Plans | TBM Information | Chat about TBM
About SME Toronto Chapter | Contact Us

SEE TBM MOVIE ...Explanation of the SME TBM Survey

TBM SURVEY

Do You Care About Manufacturing in Canada??

THEN PUSH HERE

VIDEO ...What is TBM???

VIDEO...Why is it Important?

VIDEO....Why do the Survey?

Join SME today!

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http://www.smetoronto.ca/

FABTECH ISAH Cocktail Party Quiz Results

SME LEAN Certification

Society of Manufacturing Engineers

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http://www.sme.org/leancert

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Advanced Options

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Lean Certification

- Lean Certification
- Lean Bronze Certification
- Lean Silver Certification
- Lean Gold Certification
- Lean Certification Pricing
- Preparing for Certification
- Classroom Review Program for Lean Certification
- Lean Online Review Program (LORP)
- Lean Certification: Recertification Requirements
- Lean International Reseller
- Certification Oversight & Appeals Committee
- Professional Development
- SME Certification
- Green Manufacturing Specialist Certificate
- EET Outcome Assessments for Educators
- Lean Registry
- SME Certification Frequently Asked Questions (FAQ)

Manufacturing Knowledge Resource

Lean Certification

This Lean program is the benchmark for achievements and personal growth in Lean.
Designed by three organizations – the Society of Manufacturing Engineers (SME), the Association for Manufacturing Excellence (AME) and The Shingo Prize for Operational Excellence – this alliance has established the standard for continuous improvement and Lean practices.

In 2010, the American Society for Quality (ASQ) joined this collaborative alliance, which truly aligns these leading organizations to a single standard for Lean certification, providing manufacturers and their supply chains with a roadmap for workforce development.

AME®

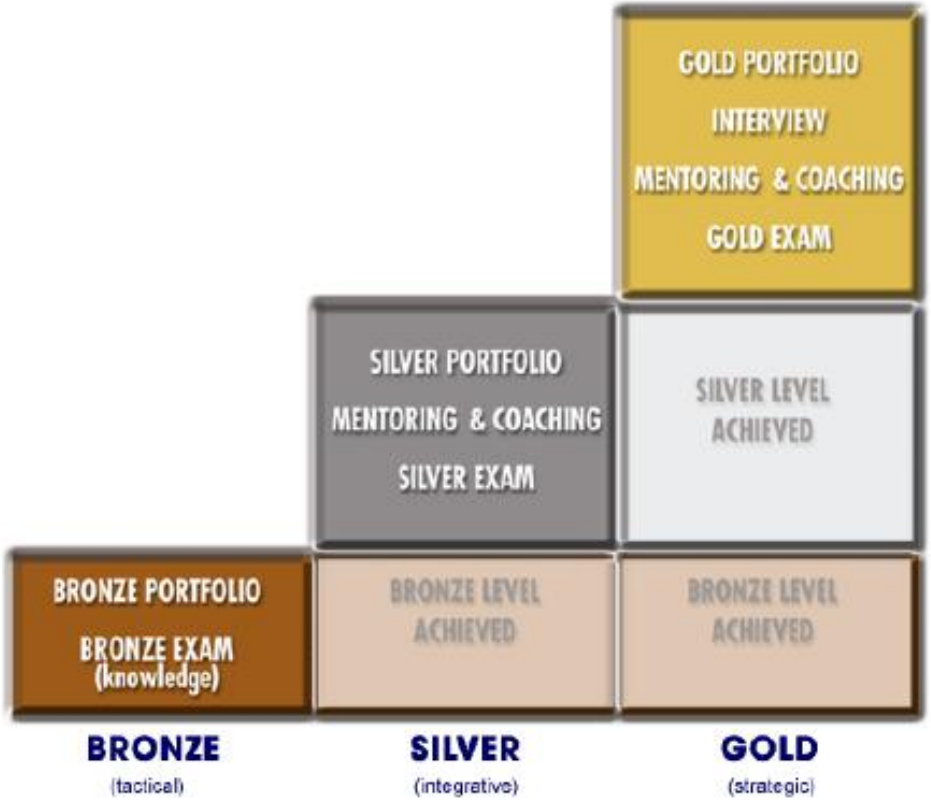
ASQ®
The Global Voice of Quality™

THE SHINGO PRIZE
for OPERATIONAL EXCELLENCE

LEAN CERTIFICATION

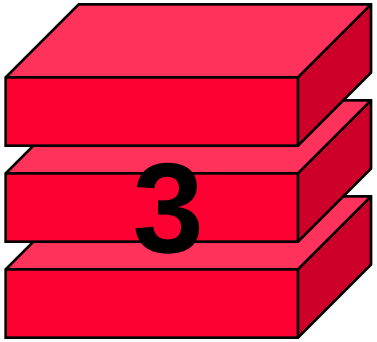
Society of Manufacturing Engineers

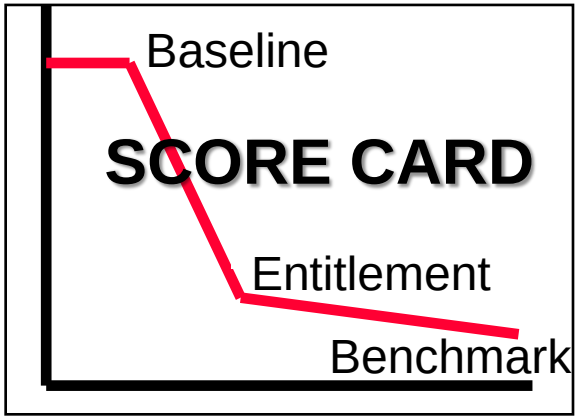
SME LEAN Certification



Everyone beginning the Lean journey starts by earning the Lean Bronze Certification (LBC). All certification candidates must complete the requirements of each level before progressing to the next certification level. This progression model shows how higher levels build upon the development acquired during previous levels.

Society of Manufacturing Engineers





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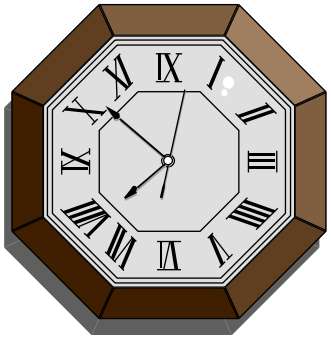
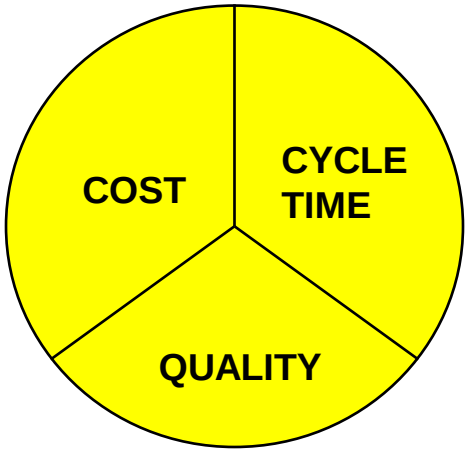
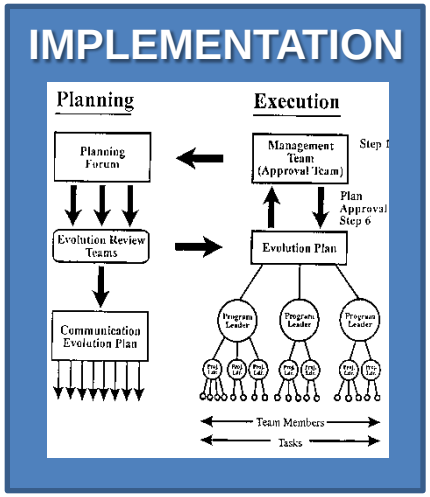
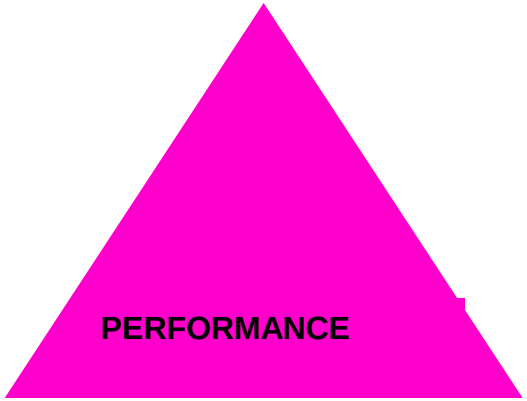
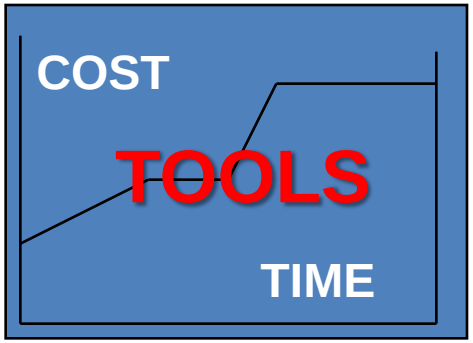


Impatience









NEXUS

INFORMATION

www.sme.org Our Corporate site to join and meet/know/grow

www.smetoronto.ca Our Toronto chapter… many events

www.sme-tbm.org The **Take Back Manufacturing** initiative and ***SME positional survey***

www.nigelsouthway.com Information on LEAN and many free positional papers

SME Lean Certification http://www.sme.org/leancert

The Lean article http://www.mmts.ca/2012/CUSTOM/Uploads/NEXUS+LEAN+Article.pdf

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