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# Value Stream Mapping: Theory & Cases

Professor Peter Hines

# Lean Enterprise Research Centre

Cardiff Business School

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- Formed in 1994 by Prof Dan Jones & Prof Peter Hines
  - 30 staff now

**“Researching, applying,  
& communicating  
*lean thinking*”**



# Overview

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- Value Stream Mapping Background
- Some of the Value Stream Maps
- Cases and Examples

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# Value Stream Mapping

## Background

# My Involvement with VSM

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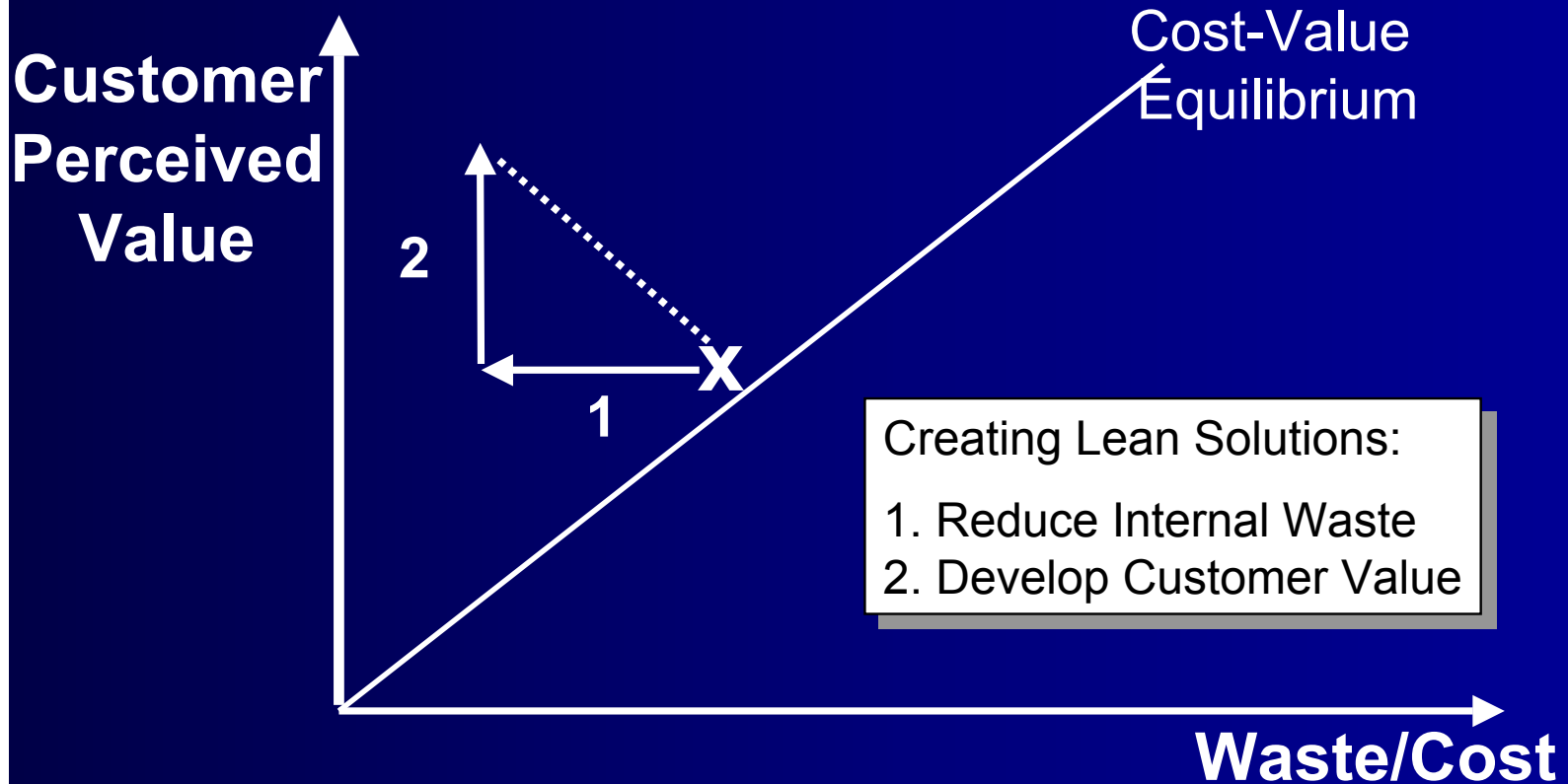
- 1993-1997**    **Supply Chain Development Programme**  
    \* **Process Activity Mapping**  
    \* **Brown Paper Mapping**
- 1997**        **Paper: The Seven Value Stream Mapping Tools**  
    \* **Codified Mapping Approach**
- 1997**        **First Rother & Shook publication**  
    \* **Big Picture Mapping**
- 1999**        **Corus-Forge-Volvo Transmission VSM work**
- 2000**        **Going Lean publication**  
    \* **see [www.leanenterprise.org.uk](http://www.leanenterprise.org.uk)**
- 2002**        **Lean Profit Potential**  
    \* **see [www.leanenterprise.org.uk](http://www.leanenterprise.org.uk)**

# What Have I Learned?

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- **Don't be a 'happy mapper'**
- **Start by understanding what you are trying to achieve**
  - Can anyone tell me the 4 Lean Principles?
  - And what about a link to Strategy?
- **Involve the recipients in the mapping**
  - Don't 'do mapping' to people
- **Don't Just Map Internally**
- **Don't Just Map Order Fulfilment**
- **No one map will do the job**
  - Chose the right maps

# Relation of Value, Cost & Waste



Creating Lean Solutions:

1. Reduce Internal Waste
2. Develop Customer Value

# We need to find the waste first

	PROCESS ACTIVITY MAPPING	SUPPLY CHAIN RESPONSE MATRIX	BIG PICTURE MAPPING	FOUR FIELDS MAPPING	DEMAND AMPLIF- ICATION MAPPING	DECISION POINT ANALYSIS	PHYSICAL STRUCTURE VOLUME VALUE
Over Production	L	M		L	M	M	
Waiting	H	H	L	H	M	M	
Transportation	H			H			L
Inappropriate Processing	H		M	M		L	
Unnecessary Inventory	M	H	M	L	H	M	L
Unnecessary Motion	H	L		M			
Defects	L		H	H			

**H = Highly useful, M = Medium, L = Low**



# Awareness Stage: 1980-1990

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<b>Theme</b>	<b>Shop Floor Practice</b>
<b>Focus</b>	<b>JIT Techniques, Tools</b>
<b>Business Process</b>	<b>Shop Floor Manufacturing</b>
<b>Industry Sector</b>	<b>Automotive Assembly</b>
<b>Gaps</b>	<b>Outside Shop Floor Outside Single Firm Narrow Focus</b>

# Quality Stage: 1990-mid 1990s

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<b>Theme</b>	<b>Best Practice Benchmarking</b>
<b>Focus</b>	<b>Cost, Quality, Reengineer</b>
<b>Business Process</b>	<b>Manufacturing &amp; Mat. Mgt</b>
<b>Industry Sector</b>	<b>Automotive Ass./ Supply</b>
<b>Gaps</b>	<b>Human Element Supply Chain Systems Perspective</b>

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# Quality, Cost, Delivery Stage: Mid 1990s-2000

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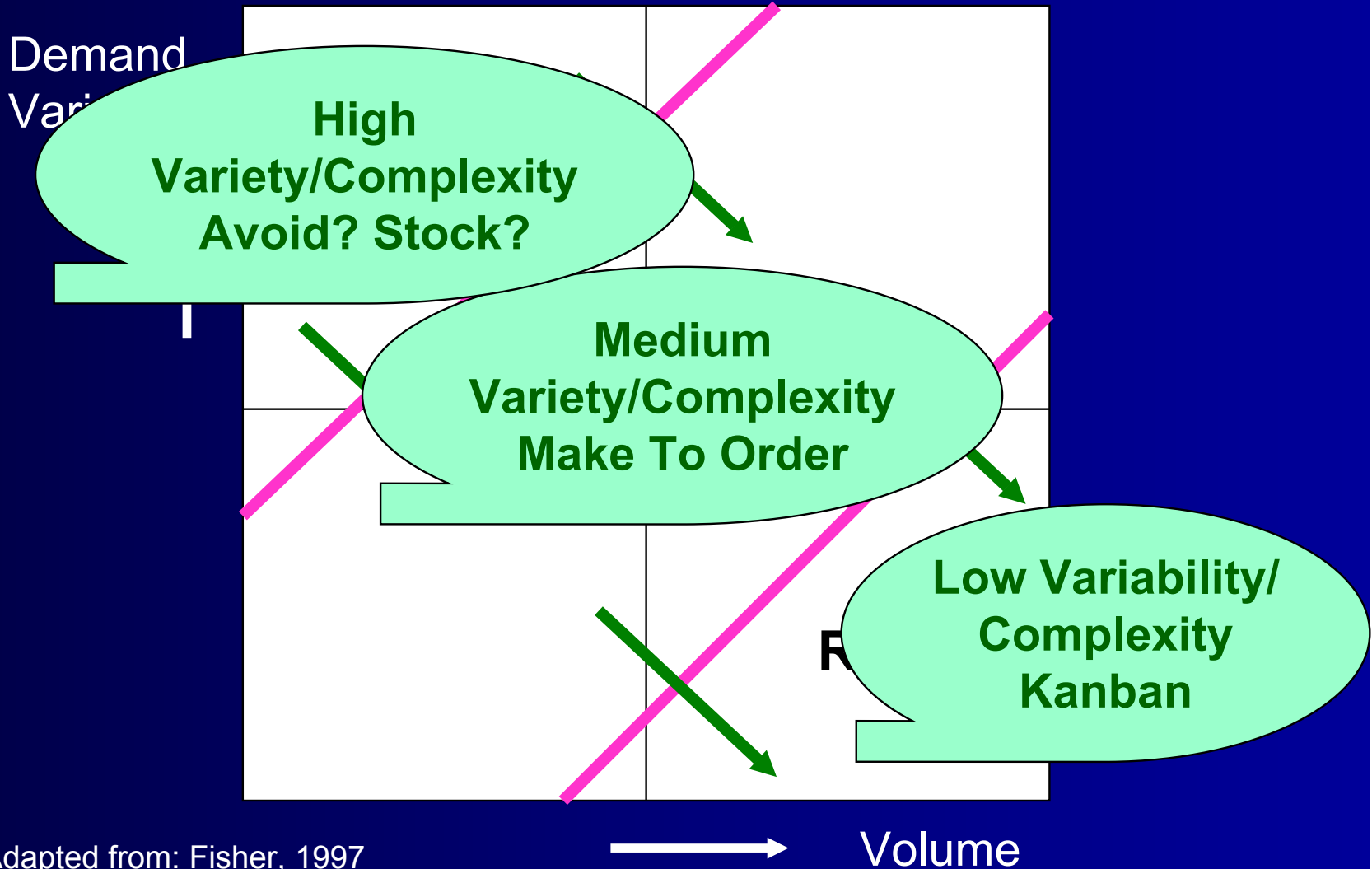
<b>Theme</b>	<b>Lean Enterprise</b>
<b>Focus</b>	<b>Cost / Process QCD</b>
<b>Business Process</b>	<b>Order Fulfilment: Val. Str.</b>
<b>Industry Sector</b>	<b>(Repetitive) Manufacture</b>
<b>Gaps</b>	<b>(Other) Process Integrate Relationships Integrating Industries</b>

# Value System: 2000+

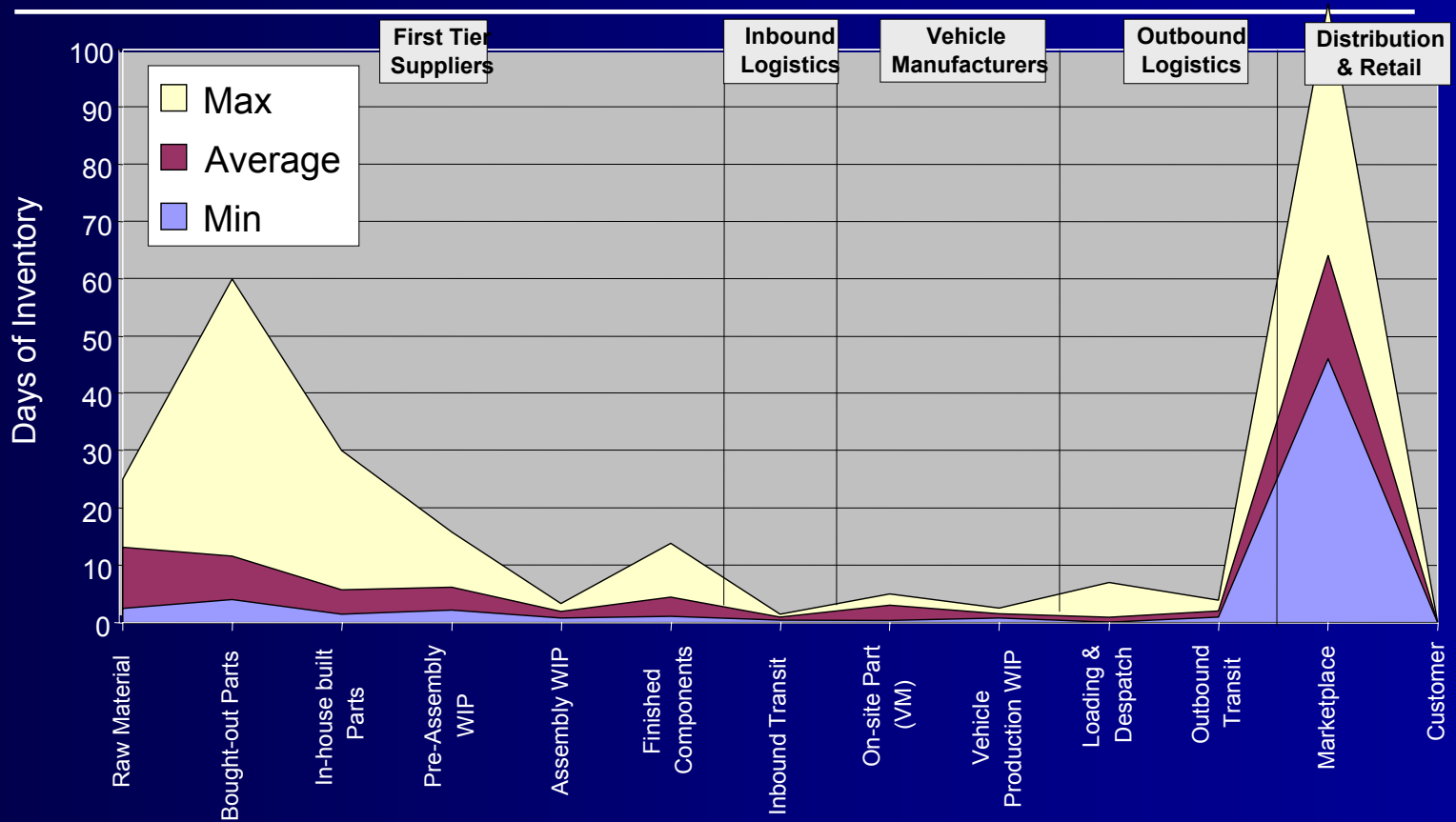
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<b>Theme</b>	<b>System Capability</b>
<b>Focus</b>	<b>Value &amp; Cost</b>
<b>Business Process</b>	<b>Integrated Processes</b>
<b>Industry Sector</b>	<b>All Manufacturing/Service</b>
<b>Gaps</b>	<b>Low Volume Manufacture Strategic Integration Total Systems Capability</b>

# Lean Network Systems



# Inventory Profile of the UK Automotive Supply Chain

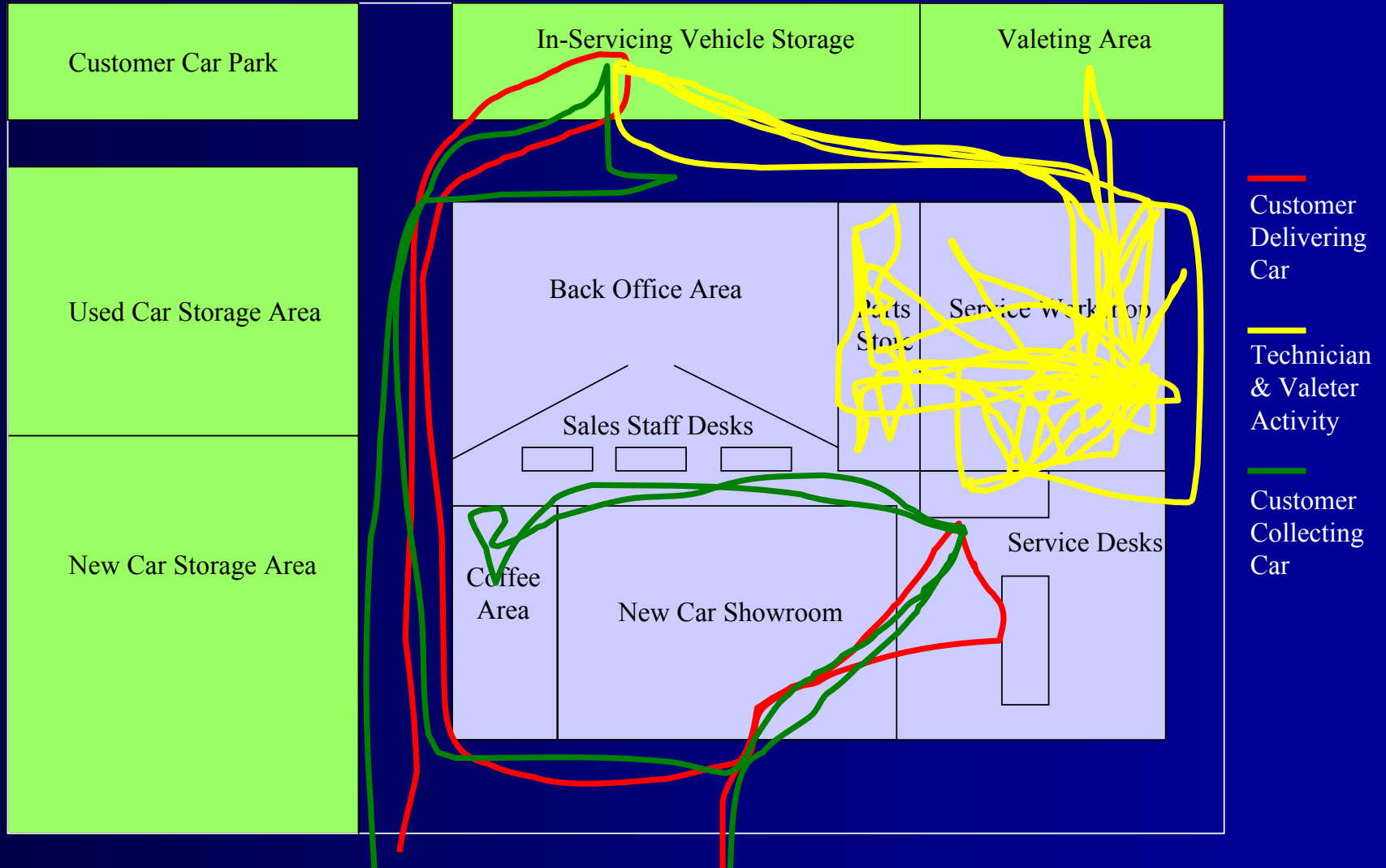


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# Some of the Maps

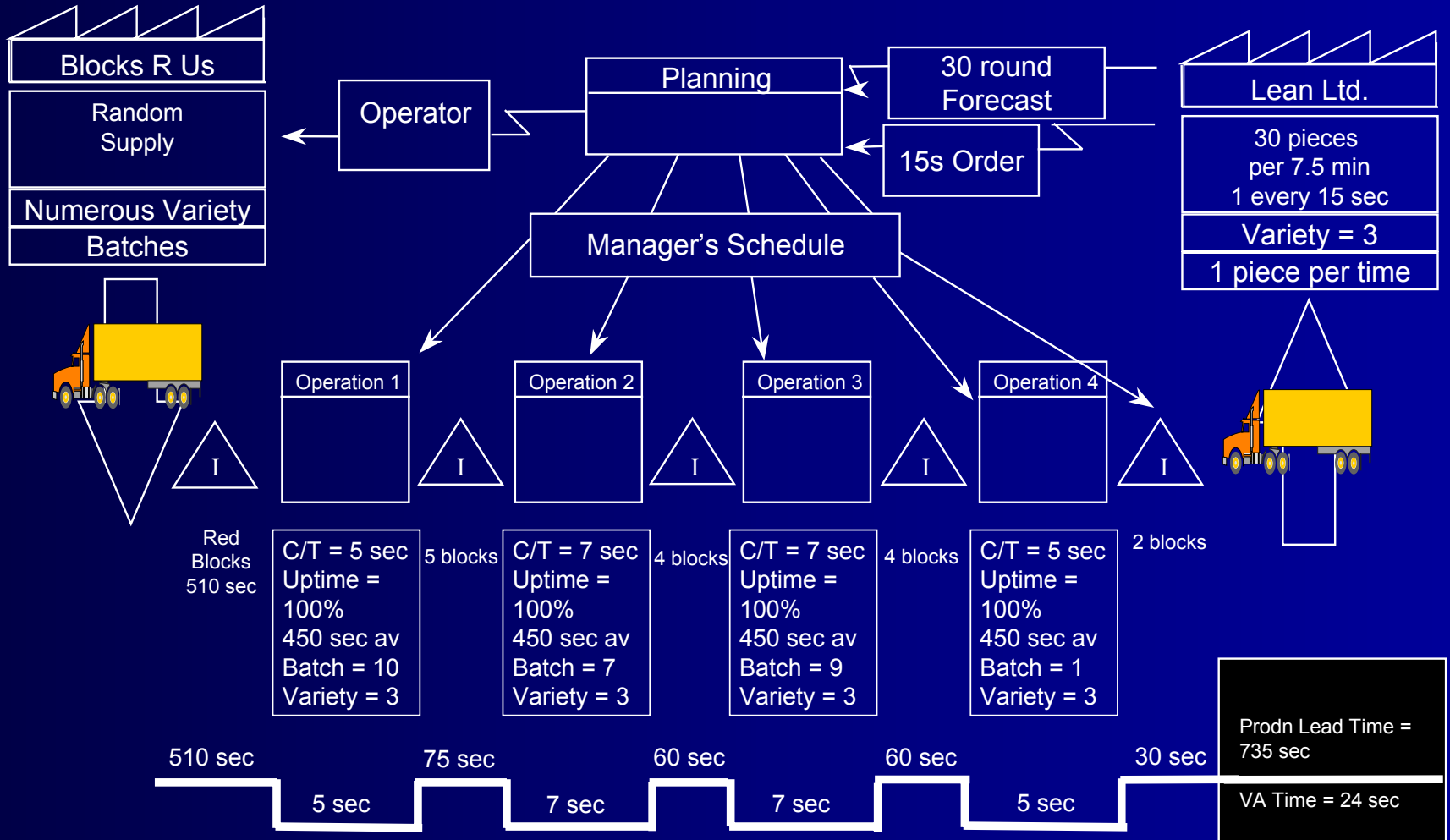
## Big Picture Level

# Spaghetti Diagram

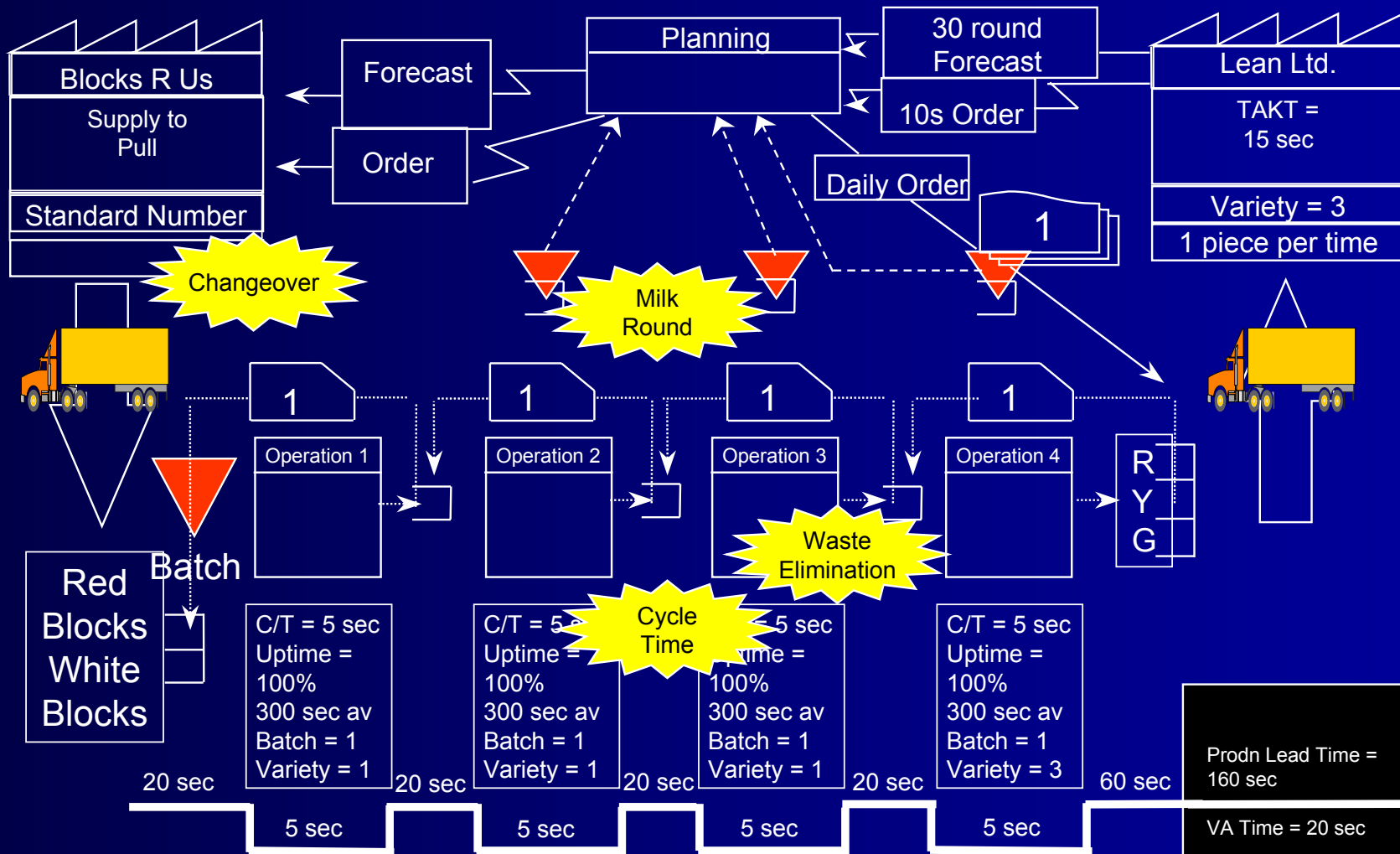




# Big Picture Map: Current State



# Big Picture Map: Future State



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# Some of the Maps

## Detailed Level

# Process Activity Map

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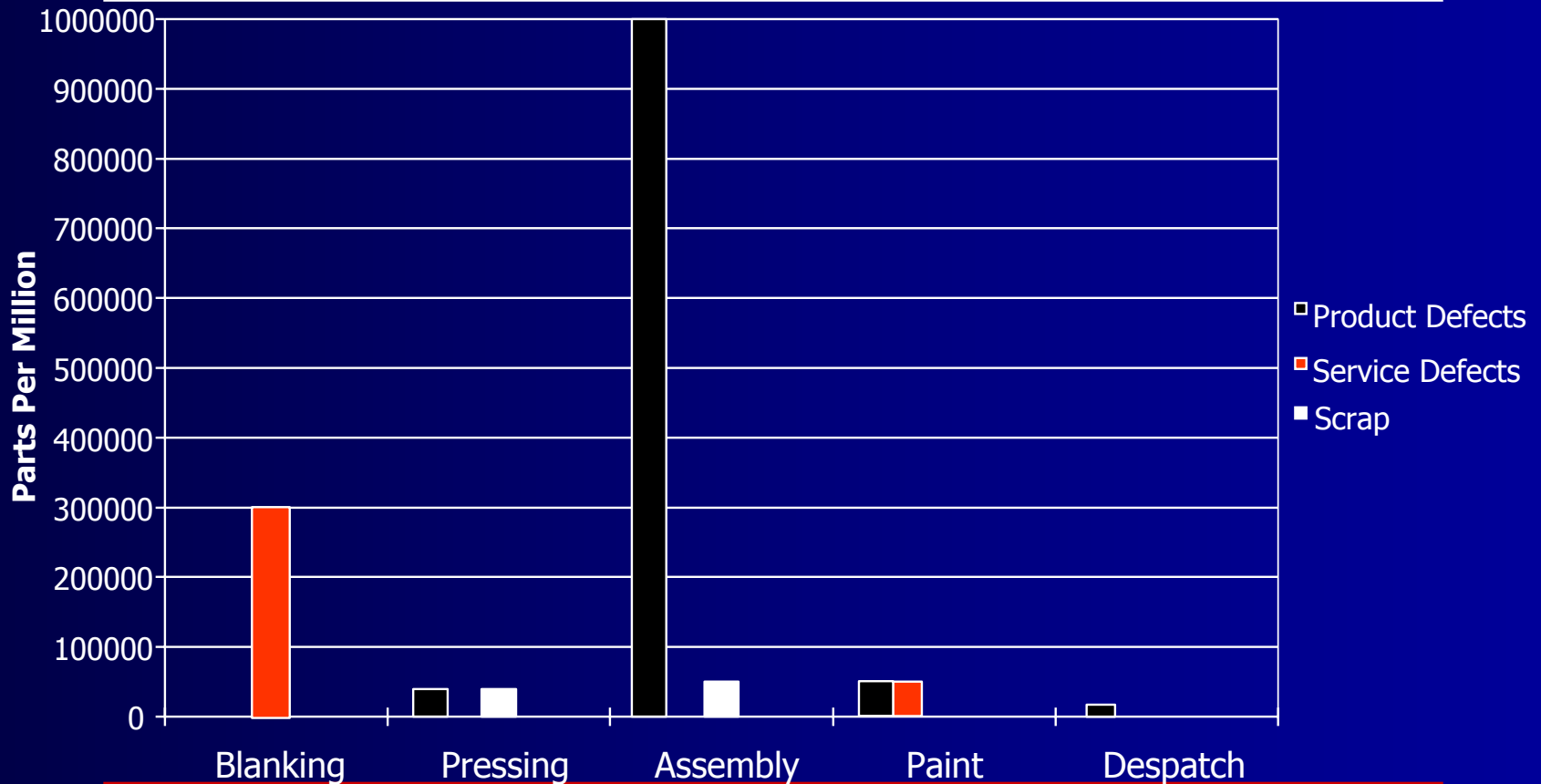
Step	Flow	VA %	Area	Dist	Time	People	C/T	Up/T	Avail. T	Batch	Var

# Quality Filter Map

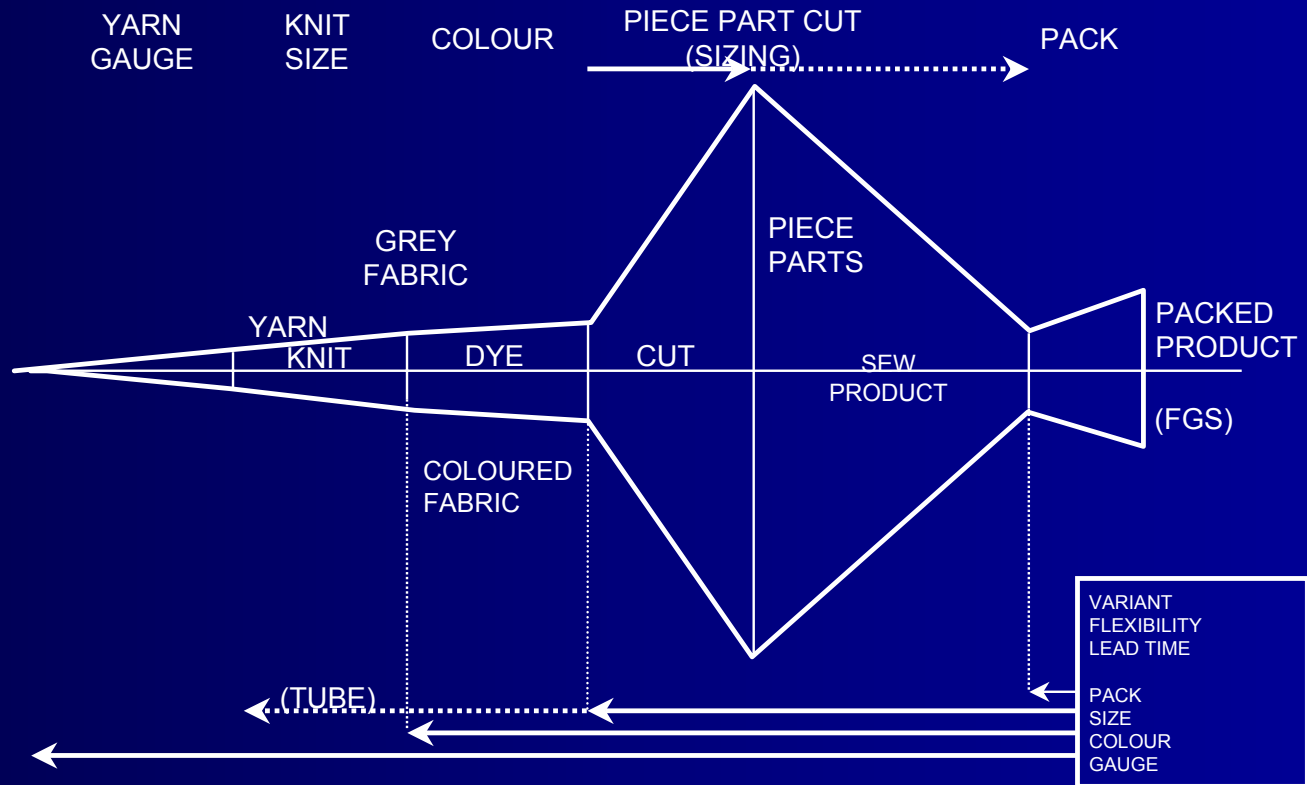
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- **Identifies where quality problems exist in the supply chain**
- **3 types of quality defect**
  - **Product defects - defects in goods that are not caught by in-line or end-of-line inspection and are therefore passed on to customers**
  - **Service defects - problems given to a customer not directly related to the product but to the level of service**
  - **Internal scrap - defects produced in a company that have been caught by in-line or end-of-line inspection**

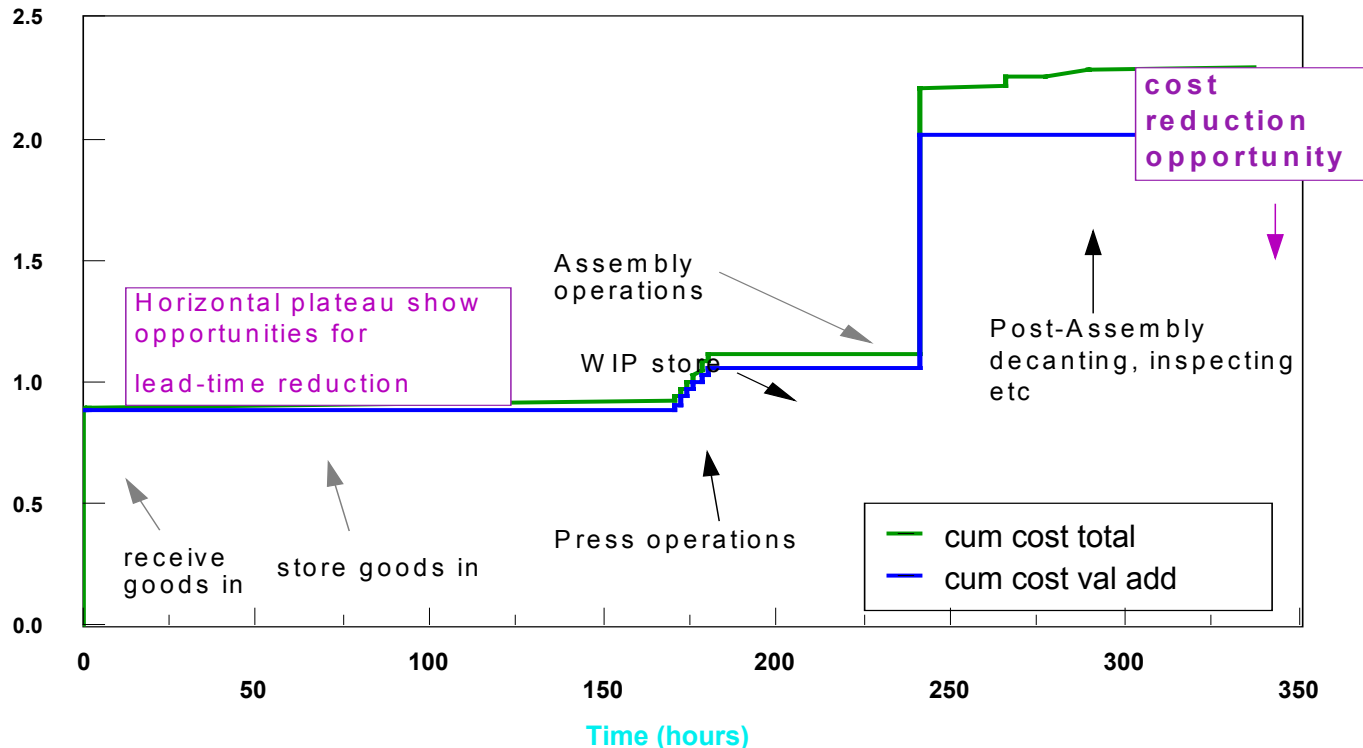
# Quality Filter Chart



# Product Variety Funnel

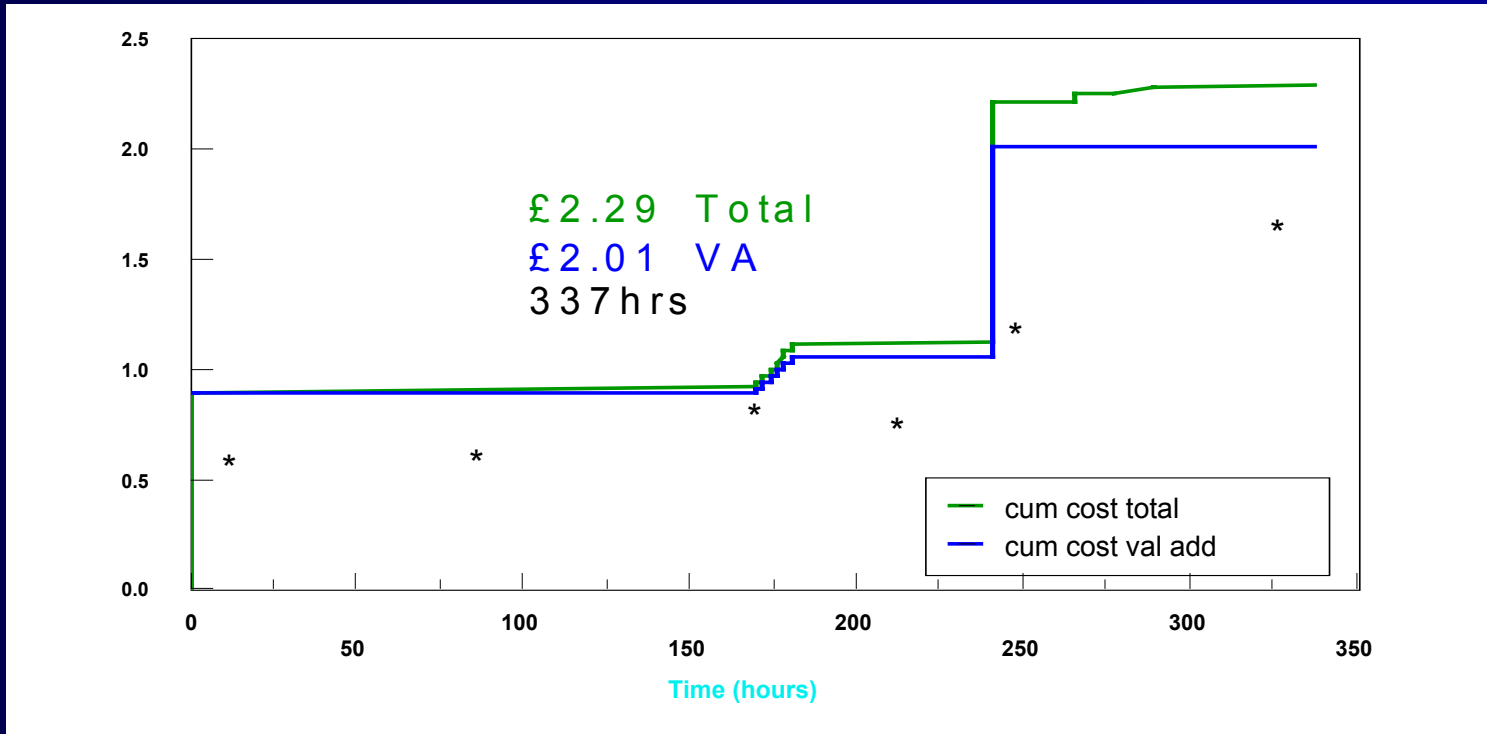


# Value Analysis Time Profile

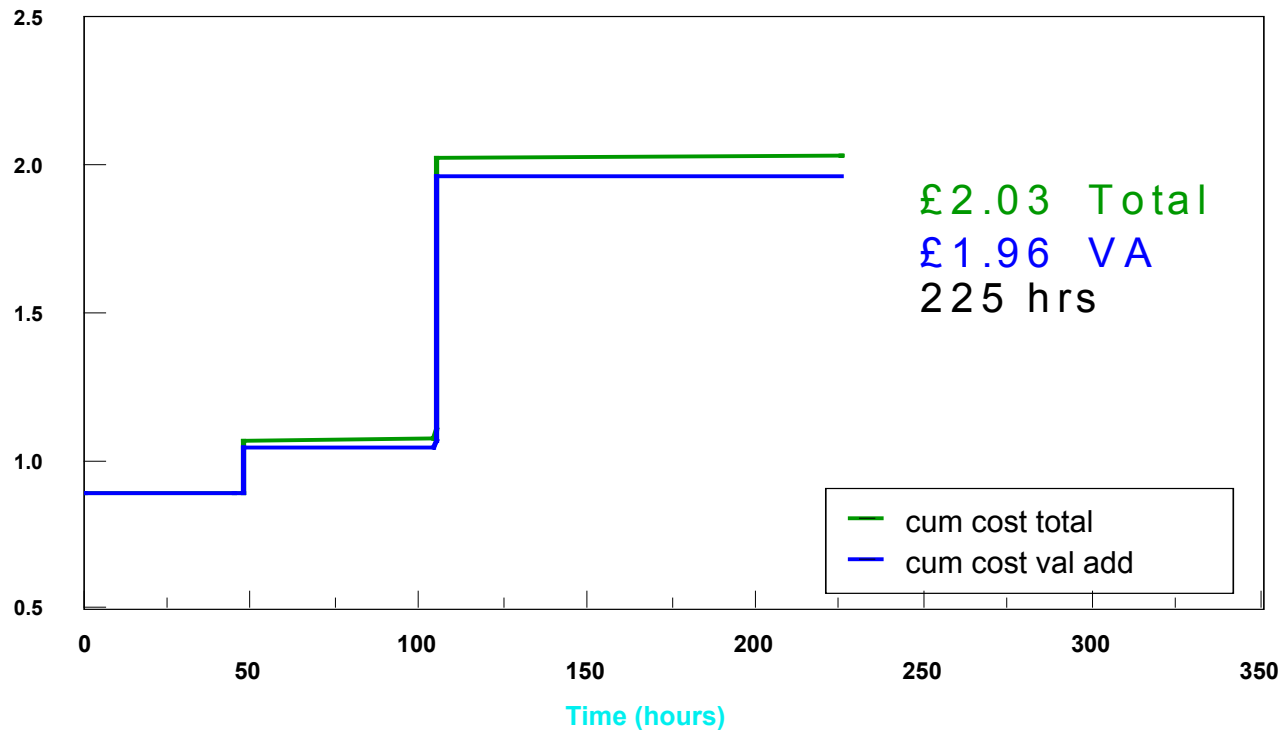




# Value Analysis Time Profile



# Value Analysis Time Profile



	Customer Service Team	Finance	Charge C/W	Non Charge C/W	Filing	Reception	Senior Finance C/W	Time	Resource	Standards & Comments
Finance Phase 2A	<p style="text-align: center; color: red; font-size: 24px;"><b>Four Field Map: Current State</b></p>							2 - 7.5 hrs	2 hrs	Variance depends on Case Worker, variable location of sort
	2 hrs	1 wk - 34 wks	1 hr	1 hr	0.25 hr	3 - 9 hrs	0.1 - 2 hrs	1 wk	0.5 hr	<p>Backlog calculated using oldest date (worst case scenario)</p> <p>Not FIFO</p> <p>Reception Tag &amp; Filing</p> <p>All file requests dealt with at the same time</p> <p>Assume 1 person processing post</p> <p>Unable to quantify referral time</p>

	Charge	Non Charge	Filing	Senior Case Worker				Time	Resource	Standards & Comments
Finance Phase 2A	<h2 style="color: red; text-align: center;">Four Fields Map: Future State</h2>							10 – 15 mins	10 – 15 mins	<p>Training needed / cultural issues to be addressed</p> <p>Charge post is sent to C/W with File (no need to pull file at later stage)</p>
								5 mins	5 mins	<p>Referral process: Matter would always be passed back to C/W after the Senior C/W has considered it, either with a work solution or guidance notes. This box to be emptied once daily (allocation rota)</p>
								2 hrs if reqrd	5 mins	<p>Non Charge post, where file needed, files to be supplied by filing 4 times daily (2 am, 2 pm) from a tray in each pod. This activity is a priority</p>
								10 mins – 2 hrs	10 mins – 2 hrs	<p>Calculated per piece of post</p> <p>Post split into 1<sup>st</sup>, 2<sup>nd</sup>, Dx</p>

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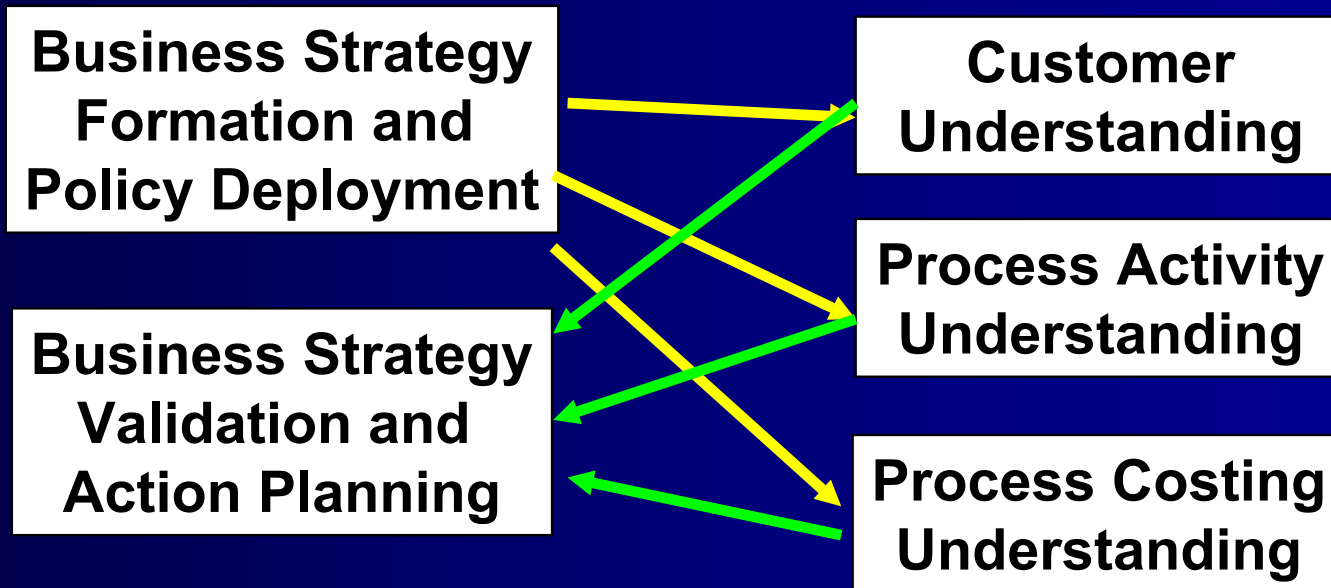
# Cases and Examples

## #1 Internal: Main Motors

# The Research Model

## Strategic Level

## Operational Level



# Critical Success Factors

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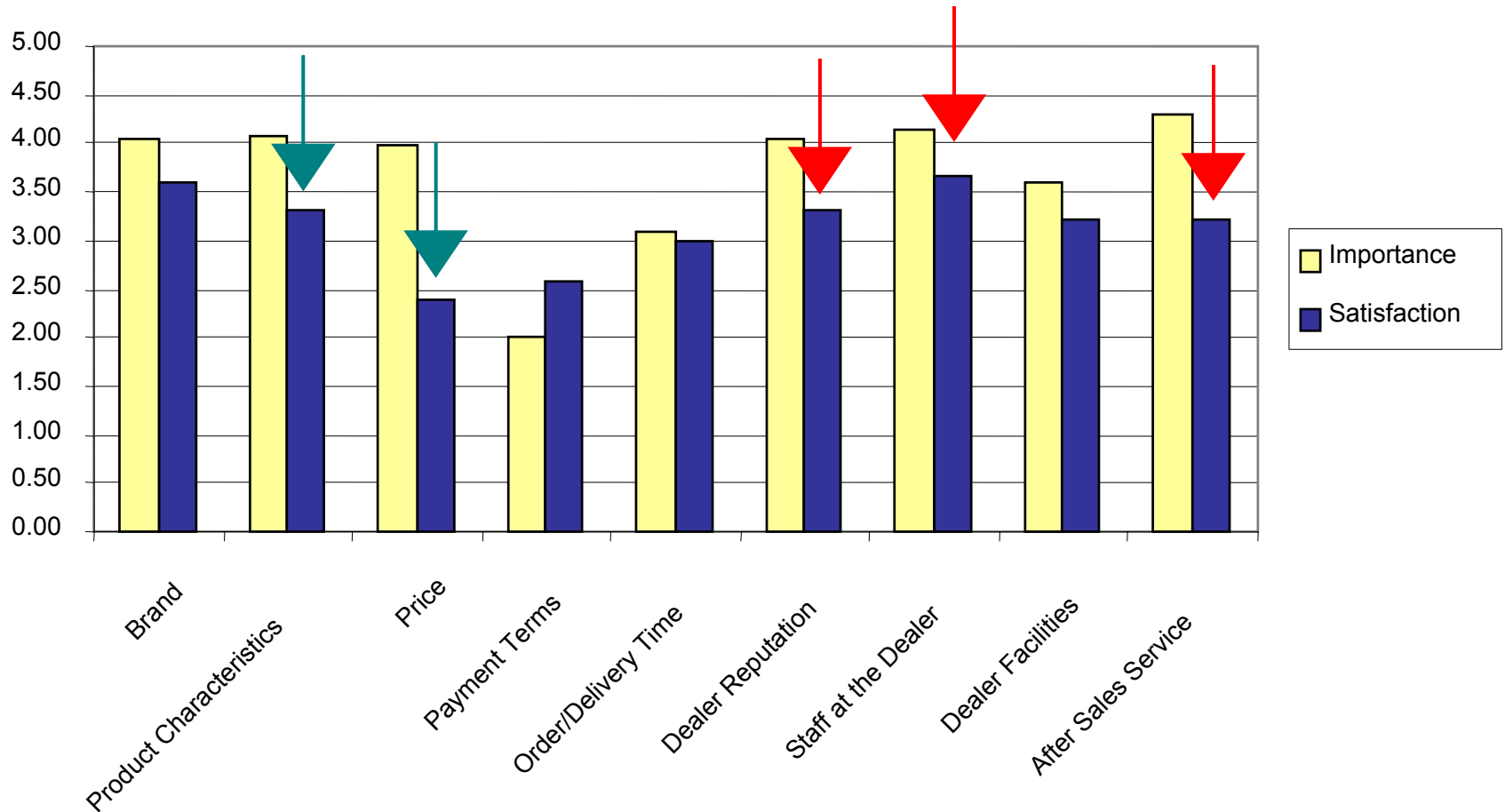
- Continue to grow markets share in the 3 channels
- Recruitment, development and retention of skilled & motivated workforce
- External influenced innovation
- Developing the right balance between the 3 channels
- Close existing & new customer relationships
- Keep the franchise
- Long term focus & profitability
- Continuing to develop brand presence

# Key Business Targets

							Vision
KPIs	Unit	Now	Year 1	Year 2	Year 3	Year 4	Year 5
Gross Profit/New Car	%	2.0%	2.3%	2.6%	2.9%	3.2%	3.5%
Gross Profit/Used Car	%	7.0%	7.6%	8.2%	8.8%	9.4%	10.0%
Finance Penetration New Cars	%	23.0%	23.0%	23.0%	23.0%	23.0%	23.0%
Finance Penetration Used Cars	%	16.0%	17.8%	19.6%	21.4%	23.2%	25.0%
Admin Expenses	%	0.9%	1.0%	1.1%	1.0%	0.9%	0.9%
Market Share: Region vs Nation	%	6.8/6.8	7.0/7.0	7.3/7.3	7.5/7.5	7.8/7.8	8.0/8.0
Retention New: First Service	%	80%	80%	80%	80%	80%	80%
Retention New: 3 years	%	30%	36%	42%	48%	54%	60%
Retention Used: First Service	%	25%	26%	27%	28%	29%	30%
Return on Total Turnover	%	1.4%	1.9%	2.4%	3.0%	3.5%	4.0%
Volumes: New Cars	#	550	580	610	640	670	700
Volumes: Used Cars	#	270	296	322	348	374	400
Service Parts Absorption	%	60%	68%	76%	84%	92%	100%
Stock Turn: Used Cars	#	8	8	8	8	8	8
Stock Turn: Parts	#	7.9	8	8	8	8	8
OCE: New Cars	%	39.5%	41.0%	42.5%	44.0%	45.5%	47.0%
OCE: Used Cars	%	38.4%	45.6%	52.8%	60.0%	67.2%	74.5%
OCE: Service	%	51.1%	55.2%	59.3%	63.4%	67.4%	71.5%
ILU skills/competency	%	45.20%	65%	75%	85%	95%	100%



# New Car Value Attributes Importance vs Satisfaction



# The Service Process

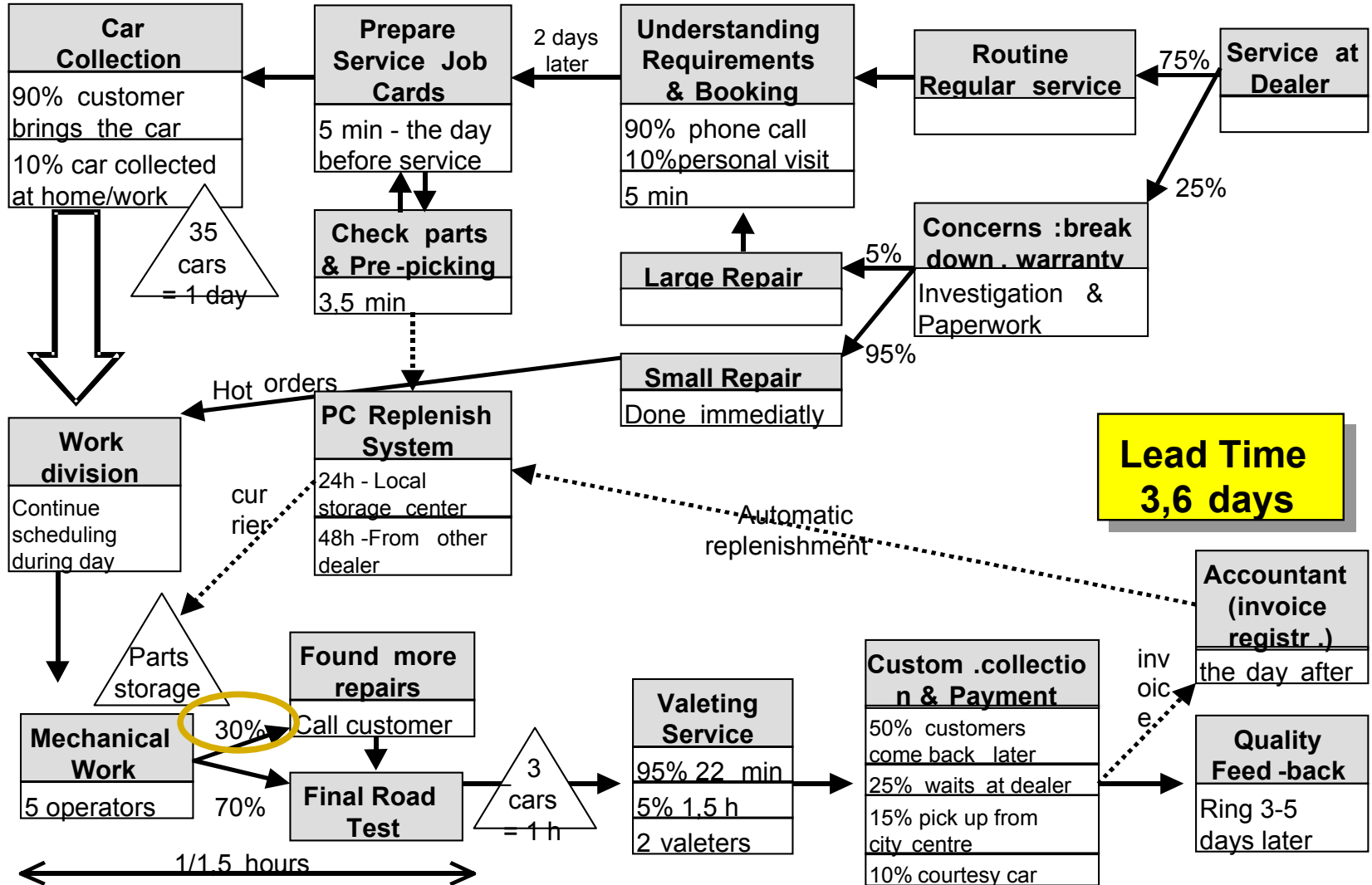
## Process Activity Mapping Example

### Process Activity: Car collection & Work division

	FLOW (O/T/I/D/D')	ACTIVITY (FVA/VA/SA /W)	AREA	DIST MTS	TIME MIN	PEOPLE
<i>Customer comes through the door</i>						
Customer arrives to Service desk and sits	T	SA	Showroom	20	0.25	1
Customer waits	D	W'	Showroom	0	2	1
Identify the customer	I	SA	Showroom	0	0.5	2
Control if job card information are correct	I	W	Showroom	0	2	2
Customer signs	O	SA	Showroom	0	0.1	2
Collect customer's keys	O	SA	Showroom	0	0.1	2
Arrangement to return car	I	SA	Showroom	0	1	2
Write arrangement on job card	O	SA	Showroom	0	0.25	1
Find a place for job card	D	W	Showroom	3	0.5	1
Waits for workshop controller	D	W'	Showroom	0	120	0
.	.	.	.	.	.	.
Ian checks job cards	I	W	Showroom	0	0.5	1
Ian informs Darren who is going to do the service	O	SA	Showroom	0	0.1	2
Darren up-dates Time Sheet	O	W	Showroom	0	0.1	1
Ian hands out work between technicians	T	SA	Showroom/Workshop	20	2	2
<b>TOTALS</b>				<b>43</b>	<b>129.4</b>	<b>20</b>

# The Service Process

## Big Picture Map

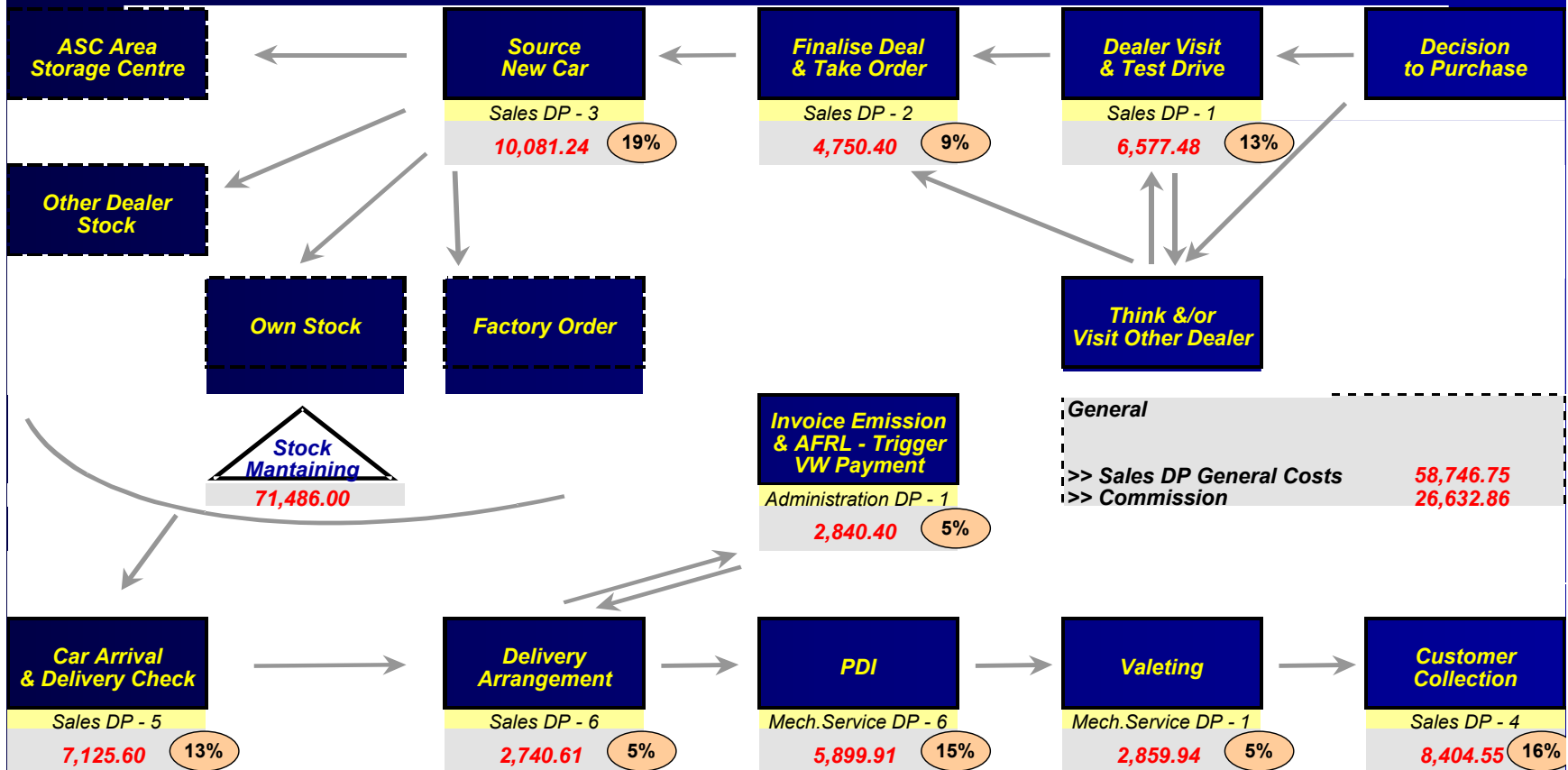


# The Costing Model

## New Car Sales Process

Activities	VA		FVA		SA		W		Activity cost	%
Visit at Dealer & take order	??	0.0%	??	0.0%	??	0.0%	??	0.0%	??	
Source car		0.0%		0.0%		0.0%		0.0%		
Car arrival, Delivery arrang. & Service Booking		0.0%		0.0%		0.0%		0.0%		
Invoice&AFRL		0.0%		0.0%		0.0%		0.0%		
PDI - Mechanical Work&Road Testing		0.0%		0.0%		0.0%		0.0%		
Valeting		0.0%		0.0%		0.0%		0.0%		
Customer Collection		0.0%		0.0%		0.0%		0.0%		
<b>Totals</b>	-		-		-		-		-	

# The Process Costing Perspective



# The Strategic Change Programme

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## Value Creation

- Used Car Loyalty Scheme
- Service Customer Care
- Service Pricing incl. Courtesy Car
- Used Car Replacement Cycle

## Waste Reduction

- Scheduling of Service Bay incl. PDI
- Scheduling of Valeting
- Right First Time Lean Servicing

## Infrastructure

- Annualised Hours
- Measurement Scheme
- Skills/Competency Scheme

## External

- Improved Supplier New Car OTD Cycle

# The Profit Potential

## (£ annually by end 2002)

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Level 1 (Internal Waste Reduction)	£ 49.6K
Level 2 (Customer Value Added)	£ 62.5K
Level 3 (Multiplier Effects)	£ 43.2K
<b>Annual Profit Potential by end 2004</b>	<b>£155.3K</b>

**Equivalent to a 105%  
increase in profitability**

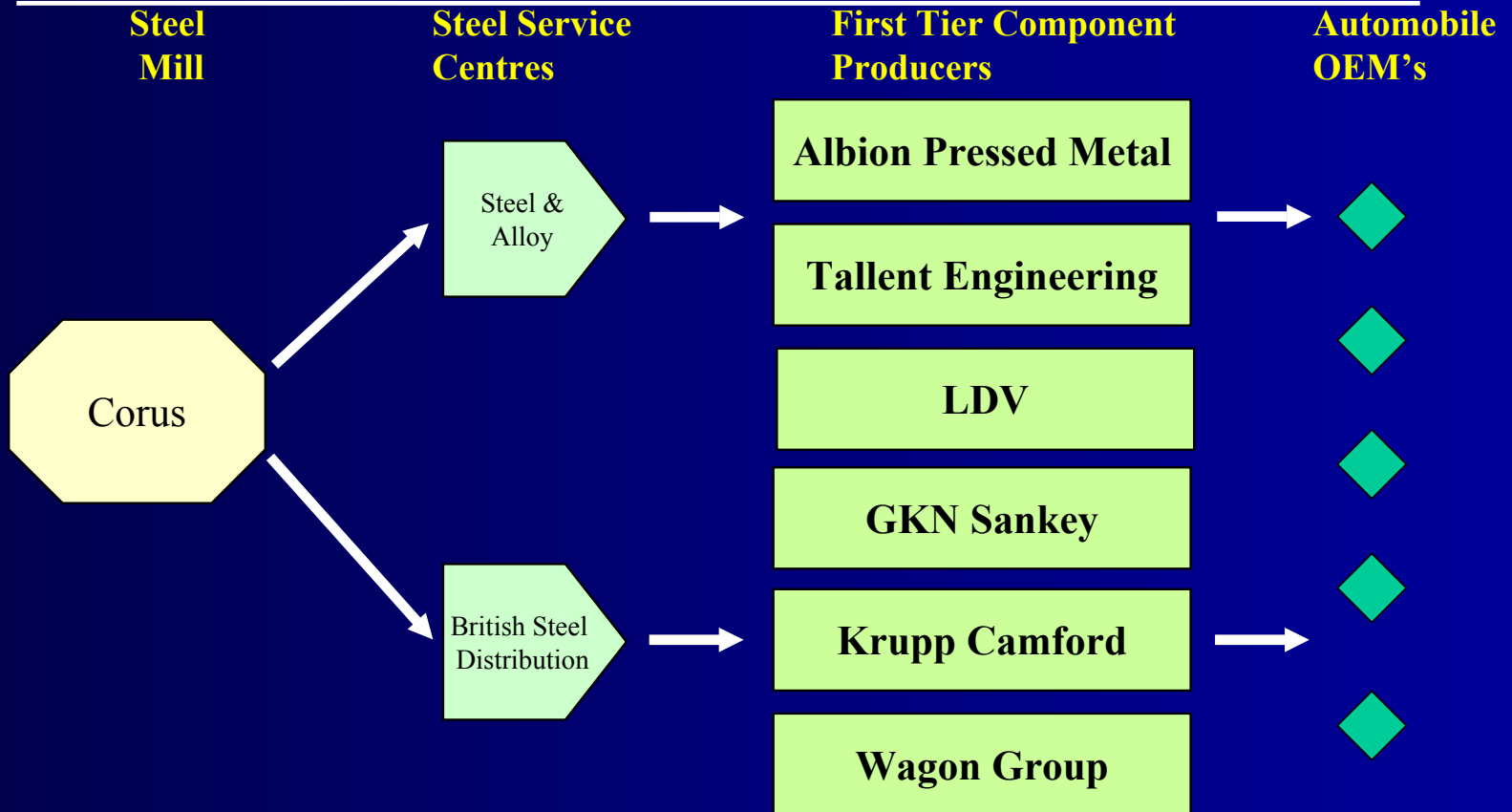
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# Cases and Examples

## #2 Supply Chain: Corus - Automotive



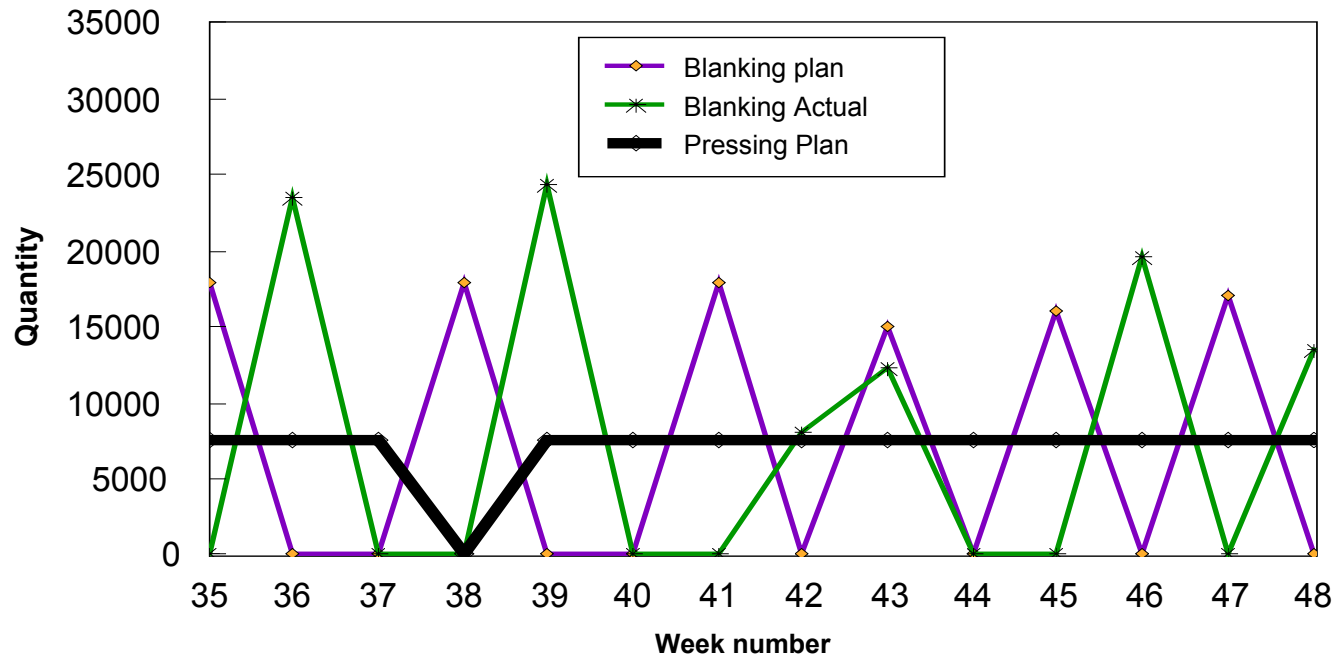
# LEAP: Participating Companies



# Specific Improvement Targets

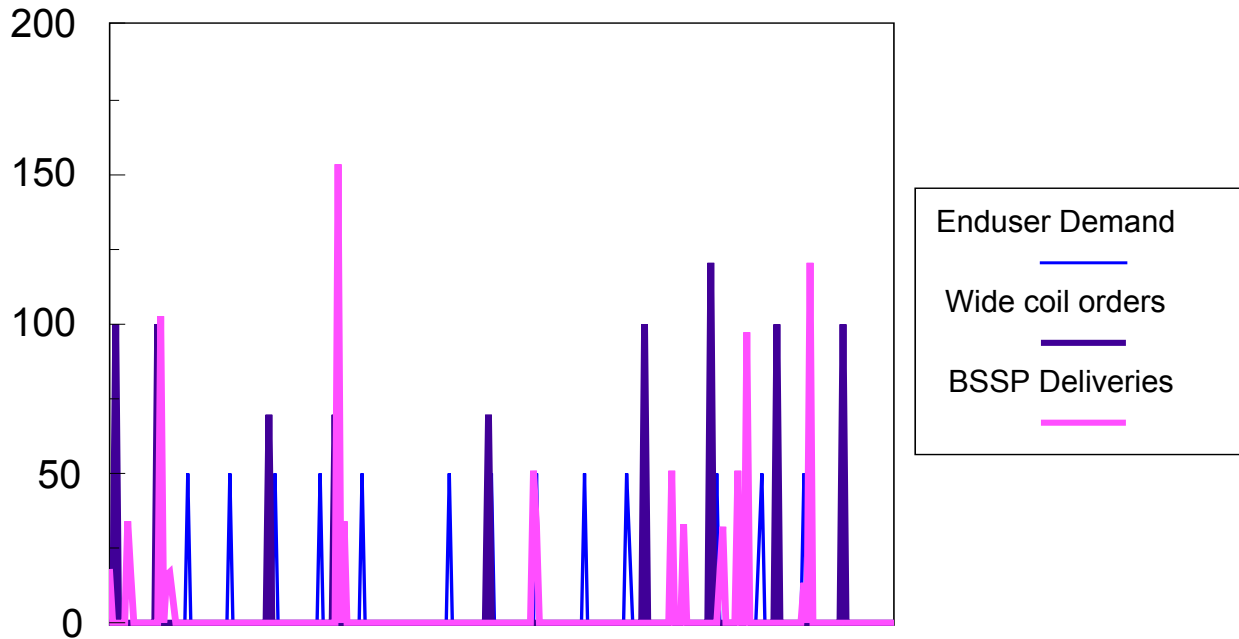
Improvement Area	British Steel Strip Products	Steel Service Centres	Metal Processing Customers	Total for the Three Tiers
1. Lead Time Reduction	40%	40%	40%	40%
2. Time to Market Reduction	30%	30%	30%	30%
3. Stock Reduction	10%	20%	20%	15%
4. Quality Improvement	50%	20%	50%	45%
5. Productivity Improvement	5% per annum	5% per annum	5% per annum	15% over 3 years
6. Increased Mutual Business	30%	30%	30%	30%

# Demand Amplification

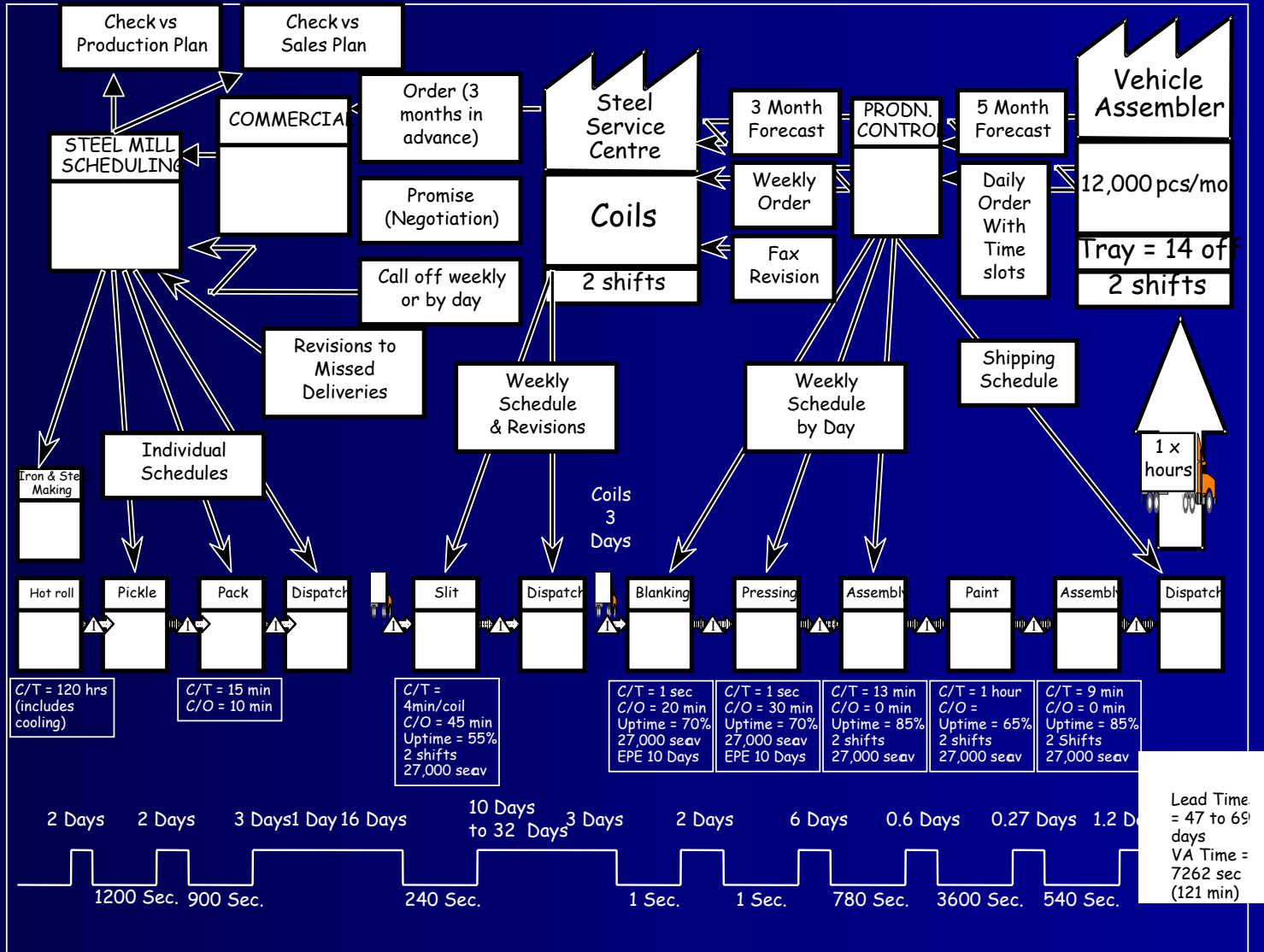


# Demand Amplification

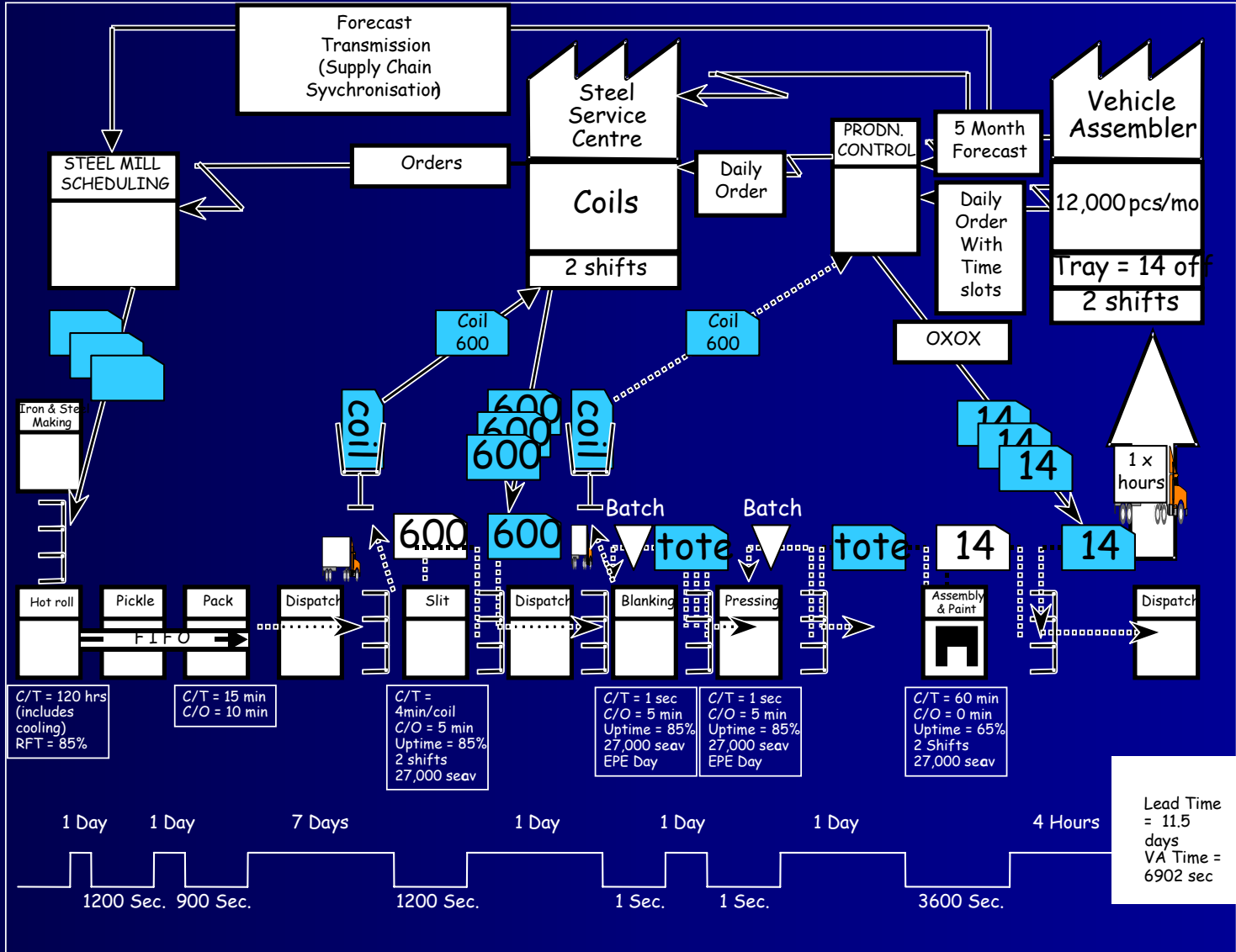
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# Current State Map for a Larger part of of Value Stream



# Future State Map for a Larger part of Value Stream



# LEAP Targets & Results

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Area	Target	Results
Lead Time	40% ▼	20-90% ▼
Stock Reduction	15% ▼	20-75% ▼
Quality	50% ▲	50 ppm
Productivity	15% ▲	8-33% ▲
Increased Business	30% ▲	40-50% ▲
Design Time	30% ▼	30% ▼

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# Cases and Examples

## #3 An Information Based Process: Insurance Company



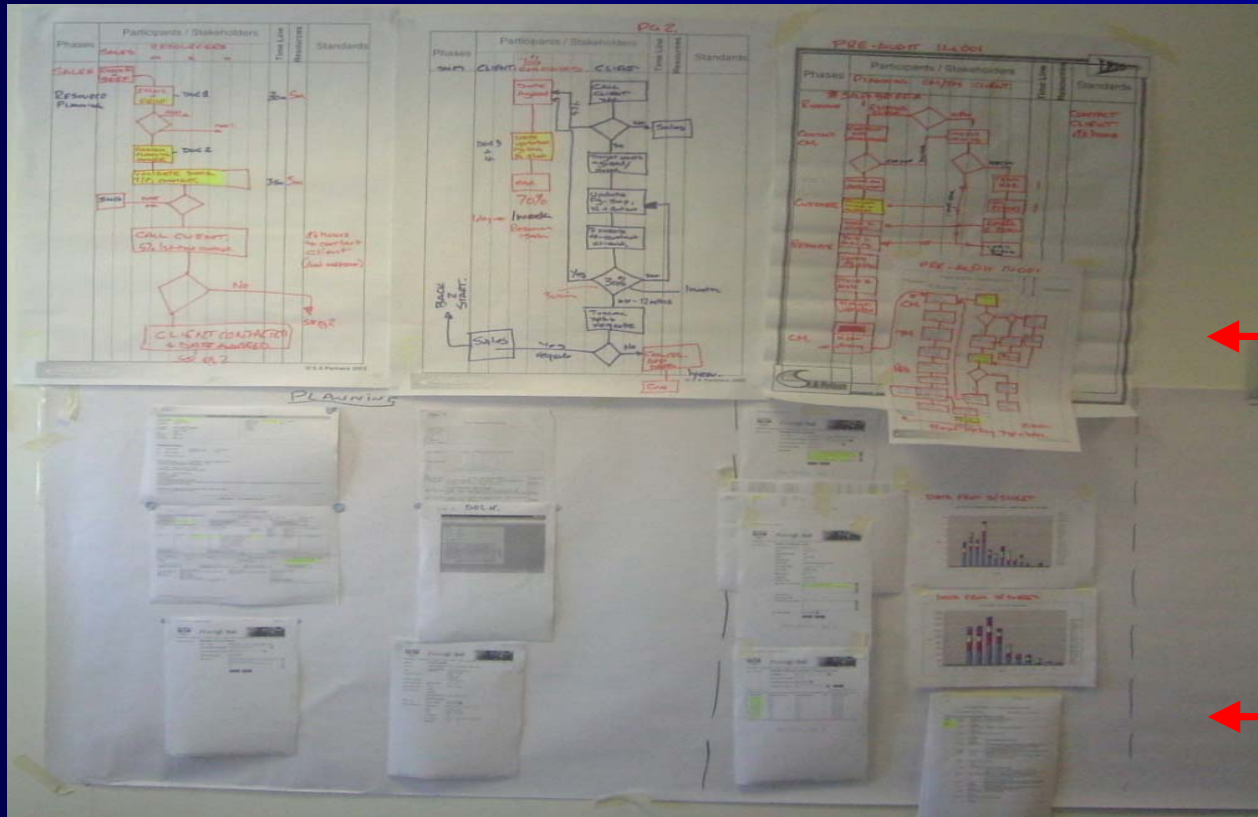
# The Twelve Phases Map

1. Planning
2. Pre-audit
3. Initial visit
4. Billing
5. Cert. production
6. Tech. Cert. review
7. Outsourcing
8. Cert. completion
9. Visit cycle
10. Billing Amf
11. Visit 1
12. Strategic review

Mapped at the 'point of activity'



# Completing the Flow



**Current  
State  
Maps**

**Paper  
work  
flow**

# Current state map

Start



# Current state map

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Finish



# Current State

Phases –	Time Line (calendar days)				Resource			
	Minimum		Maximum		Minimum		Maximum	
	Days	Hours	Days	Hours	Hours	Mins	Hours	Mins
1. Planning process	2		10			25	1	
2. Pre-audit	3		30			20		40
3. Initial audit	3		30			20		40
4. Billing	2		8			10		30
5. Cert. Production & proof reading	1		10			32	2	40
6. Tech. cert. review	17.5		47.5		1	9	3	1
7. Outsourcing	14		14		4		4	
8. Cert. completion	2.5		3			21		26
9. Visit cycle	0.5		6			27		55
10. Billing AMF	1		7			12		12
11. Visit 1	2		31		2	15	4	15
12. Strategic review	9		26		2	50	10	50
Total of process	42.5		201.5		8	49	24	57

# Phase 1 – Resource Planning

Major Wastes	Root Cause		Opportunities	
	Process	Culture	Process	Culture
Print of email (sales brief)		Comfort factor	Read electronically	
Validation of data	Information not right	Lack of trust	Review format of data – sales brief and sales application checklist. Planning to fail (brief may say 6-8 months) Ownership from sales – resp/training to get it right	
Single point of contact (1 <sup>st</sup> time)	Planning to fail	Always done it this way	Obtain alternative contacts from client (education of client re: status of registration)	
Use of planning spreadsheet/correspondence log	Current systems do not allow for monitoring as per s/s	Comfort/lack of trust	Investigate system capability	
Readiness of client	Sales target driven. Communications/Education of client. Information not right	Always done it this way	Modules for clients. Education of client. Staff training (pick up on buying signals/leads etc). Opportunity to influence ass via financial incentives etc	



[1]

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# Future State

Phases –	Time Line (calendar days)				Resource			
	Minimum		Maximum		Minimum		Maximum	
	Days	Hours	Days	Hours	Hours	Min	Hours	Min
Planning	1		5			35	1	35
Pre-Audit visit and Reports	1		3			10		15
Visits and reports	3		15		3	10	13	30
Post visit support service	0		9			0	3	6
<b>Total</b>	<b>4</b>		<b>32</b>		<b>3</b>	<b>55</b>	<b>18</b>	<b>26</b>

**85% reduction in time**  
**50% reduction in resources**

# What Have You Learned?

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- **Don't be a 'happy mapper'**
- **Start by understanding what you are trying to achieve**
  - Can anyone tell me the 4 Lean Principles?
  - And what about a link to Strategy?
- **Involve the recipients in the mapping**
  - Don't 'do mapping' to people
- **Don't Just Map Internally**
- **Don't Just Map Order Fulfilment**
- **No one map will do the job**
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