

LEAN MANUFACTURING:
PUTTING THE CUSTOMER FIRST

Funded by the Workplace English Language and Literacy (WELL) program

TRAINER GUIDE

Lean Manufacturing: Putting the customer first

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INTRODUCTION

Welcome

Welcome to the Trainer Guide for *Lean Manufacturing: Putting the customer first*, an interactive resource funded by Workplace English Language and Literacy (WELL), a division of the Commonwealth Department of Education, Science and Training. This resource is the second in a series of resources on Competitive Manufacturing. The first was *Lean Manufacturing: Solving problems, working together* (2006). This resource introduces new topics and tools to cover:

- Improving process flow, sustain process improvements
- Meeting cost requirements of the customer, reduce cost & waste
- Root Cause Analysis
- Using sustainable energy and environmental practices.

This Trainer Guide is designed as a resource for trainers, mentors and others involved in developing skills and knowledge for workers in the manufacturing industry.

The Trainer Guide extends the learning in the CD-ROM. It can be used for self-paced or instructor-led learning. The Trainer Guide contains suggested methods and approaches to support learners as they master the skills and concepts covered on the CD-ROM and its printable resource sheets.

In the Trainer Guide you will find:

- An overview of the resources
- Suggestions for group discussion

- Ideas for workplace observation
- Additional content on some of the topics
- Further activities and opportunities for skills practice.

The Trainer Guide is not a stand-alone resource. It has been designed to match the topics found on the CD-ROM. It is therefore strongly recommended that you work through this Guide following the topics and activities on screen.

The Trainer Guide offers ideas for learning and teaching. You may choose from the suggestions. Learning objectives are written at the beginning of each topic to guide the standard expected for learners at Certificate III level. However, you may wish to write your own learning objectives or to adapt activities to cover the training gaps in your own organisation.

Purpose of the CD-ROM

Lean Manufacturing: Putting the customer first has been developed particularly for those who have not fully mastered the English language or who may need assistance with reading, writing and/or numeracy tasks. Others who are new to the concepts of lean manufacturing or who need to refresh their knowledge may also find the resources useful.

The CD-ROM may be used in classroom settings, for one-to-one instruction, small group activities or (for those who are more confident with computer technologies) as a self-paced learning resource.

The CD-ROM uses a variety of media (text, graphics, voice, video, animation) to introduce the central concepts and vocabulary of competitive manufacturing. The central focus is on basic problem-solving tools. It is designed to provide students with underpinning knowledge about some of the units of competence for the Certificate III in Competitive Manufacturing (MCM04).

Relation to the Training Package

It is important for you and your learners to understand that *Lean Manufacturing: Putting the customer first* has been mapped against the skills and knowledge that underpin certain competency units in the Competitive Manufacturing Training Package (MCM04). The CD-ROM is not designed as a learning program that results in a credential for those who complete it. Achievement of prescribed competency units can only be assessed by a Registered Training Organisation, based on the learner's performance over time in an actual or simulated workplace.

Learners who wish to apply for formal assessment may however wish to save some of the activities in *Lean Manufacturing: Putting the customer first* in a folder that can be presented as part of the assessment process—see Learner Guide for details.

Five competency units

The on-screen materials and the Resource Sheets, together with additional activities in the Trainer Guide, support the general knowledge requirements of the following competency units:

MCMS201A—Sustain process improvements

MCMT280A—Undertake root cause analysis

MCMT231A—Interpret product costs in terms of customer requirements

MCMT270A—Use sustainable energy practices

MCMT271A.—Use sustainable environmental practices.

However, none of these units is covered comprehensively. The CD-ROM only provides concept and vocabulary understanding to enable students to apply their learning in greater depth within a real manufacturing environment. The Competitive Manufacturing Certificate is a practical qualification designed for learning in the context of a working manufacturing company that is engaged in productivity improvements in line with lean manufacturing principles.

More details about assessment may be found in the Learner Guide, which can be downloaded from the Home Page of the CD-ROM.

The developers wish to point out that the ‘content’ of the CD-ROM and the Resource Sheets was developed with the underpinning knowledge of five competency units in mind. We do not however claim to have covered every item listed in the five competency units, but have adopted instead a more holistic approach. The Appendix to this Guide lists the units and their elements and provides an indication of which sections of the CD-ROM and which Resource Sheets best meet the knowledge requirements of each competency unit. It is emphasised that much of the content provided has a generic value that may apply to two or more competency units or even to units in the Training Package that we have not specifically addressed.

Structure of the learning materials

The CD-ROM is divided into five sections. It is best to work through these in the order presented, although it is also possible to simply ‘pick out’ those areas that match the needs of individual learners. The sections are listed below.

- Introduction—Acme Industries (some ‘lean’ concepts, Kaizen, reduce–reuse–recycle)

This is followed by four longer sections, each of which focuses on a case study:

- Automotive Metals (improving process flow, seven wastes, sustainability)
- Eco Furniture (meeting the needs of customers, problem solving tools, sustainability)
- Dynamic Die Casters (takt time, cycle time, lowering costs)
- Tuff Stuff Adhesives (reducing environmental damage, visual factory, root cause analysis).

The case studies are based on real manufacturing companies, each with its own special problems. The companies provide an environment to apply the tools and gain a better understanding of lean manufacturing. Text, graphics, voice, animation and video engage learners in the content. There are also resource sheets that can be printed out and an interactive quiz that completes each section, providing learners with a self-check on learners’ knowledge.

Methodology

You need to bear in mind that the CD–ROM is written for workers with English language, literacy and numeracy needs. In addition, many may be somewhat ‘computer-shy’. The Learner Guide provides advice on how to use the CD–ROM. Trainers would be well advised to spend some time, early in the program, ensuring that learners are confident with this learning technology. We have designed the CD–ROM to be as ‘user-friendly’ as possible.

Coloured words on the screen ('hot words') provide pop-up explanations on mouse rollover and all key words are listed in a glossary at the back of the Learner Guide. Key words and phrases are highlighted for most topics in the Trainer Guide as a reminder to you that help may be needed. Familiar examples from your workplace will assist an understanding of terms like

kanban

poka-yoke

takt time

one-piece flow.

Depending on circumstances, you might like to use the printed glossary in the Learner Guide for an occasional vocabulary-building exercise. You should also encourage learners to roll the mouse over 'hot words' on their screens and find meanings for themselves.

Resource Sheets

There are 19 Resource Sheets on the CD-ROM. These can be brought on screen by clicking on the Resources tab at the top of the screen. A PRINT button is provided for each. The Trainer Guide indicates where there is a Resource Sheet that you can use for discussion. You may like to mention this to the learners so that they can follow up in their own time and place.



Resource Sheet
[#]

This is a Trainer Guide reference to a Resource Sheet that can be read on screen or printed out.

Some Resource Sheets provide learning activities that can be included in a folder for the purposes of competency-based assessment—please refer to the Learner Guide for details.

Your role

The role of a trainer is in some ways quite different to the role of a classroom teacher or subject expert. A key and obvious difference in the trainer's role is that the content and learning activities are usually already provided in the learning materials, whether in print, on CD-ROM or online.

This means that your role is much less that of the content expert (and presenter) and much more that of the supporter (or facilitator) of learning. Of course, many of the basic tasks of teaching remain the same and you will need to draw on all your skills and experience to:

- Motivate learners and build their self-confidence
- Contribute real-world context and experience
- Identify problems and early warning signs
- Answer content queries
- Help learners to work through difficulties in the tasks or activities
- Provide further information
- Explain assessment tasks and requirements
- Help learners select assessment options
- Provide tips on how to learn.

You will need to take the initiative in generating and encouraging communication. This can be a challenging and demanding task that requires sensitivity and skill, especially where learners are 'computer-shy' as well as limited in their range of literacy and numeracy skills. One key

strategy is to find out as much as possible about each learner from the outset.

Another important aspect is ‘learning to learn’—helping learners plan and monitor their own learning development. This is particularly important if learners are new to learning online. The Learner Guide for *Lean Manufacturing: Putting the customer first* has some useful tips for first-time users of technology and you can help build confidence by taking individual learners through the steps—starting the CD, opening the program, navigating, doing an activity, printing out a Resource Sheet, etc.

Please note that we recommend Internet Explorer as the most effective browser in which to open this CD.

The developers welcome any feedback you may have on ways to improve these resources. Please contact the instructional designer, Dr Brian Elkner at Workplace Learning Initiatives—brian@wli.com.au—with any comments or suggestions.

Lean support

This 'chapter' is for your own use, so you can further explore the concept of lean manufacturing. You might also consider forwarding these pages to business operators and owners who may be interested in getting government support for 'lean' reforms. This is just a short list of the many resources that offer information and support for lean manufacturing initiatives.

AusIndustry

AusIndustry is the Australian Government's business program delivery division of the Department of Industry, Tourism and Resources and it provides a range of incentives to support business innovation, including the implementation of lean manufacturing.

AusIndustry delivers a range of more than 30 business products, including innovation grants, tax and duty concessions, small business services, and support for industry competitiveness worth nearly \$2 billion each year to about 10,000 small and large businesses.

To find out more about grants and concessions that may be available to your business, visit this site: <http://www.ausindustry.gov.au/>

CMI and MSA

The Competitive Manufacturing Initiative (CMI) is a collaborative response from Australia's Manufacturing Industry Training Advisory Boards (ITABs) to assist manufacturing industries to take advantage of some of these improvement opportunities through innovative vocational education and training to employees.

The CMI website provides information about the Competitive Manufacturing Training Package, a list of contacts, a newsletter, learning

resources, implementation strategies and case studies about lean manufacturing.

The Competitive Manufacturing Initiative has been incorporated into Manufacturing Skills Australia, an industry skills council that aims to be the voice of the 75,000 businesses that employ more than a million Australians in the manufacturing industry. MSA is a linking agent for government activities, programs, strategies and research into skills needs.

You can find more information about CMI and MSA at:

<http://www.cmi.org.au>

<http://www.mskills.com.au/>

QMI

QMI Solutions, formerly known as the Queensland Manufacturing Institute, has a \$20 million facility located at the Brisbane Technology Park. It was established in 1993 as a joint venture between the Queensland Department of State Development (DBIRD as it was then known), CSIRO, DET and QUT. QMI helps companies on the journey to manufacturing excellence through its knowledge and expertise, applied research and advanced training and process engineering.

You can subscribe to the site and make use of an extensive library of resources, a newsletter and advice on implementation:

<http://www.qmisolutions.com.au>

Strategos

Strategos is part of an international network of lean manufacturing advisors. The Australian site provides overviews, resources, newsletters and a range of books, articles and interactive 'lessons' on lean

manufacturing. Subscription to the site gives you access to a wide range of contacts and resources, as well as the opportunity to purchase consulting services: <http://www.strategosinc.com/>

Workplace Learning Initiatives Pty Ltd

WLI is a Registered Training Organisation with extensive experience in providing Vocational Education and Training in industry. As the maker of this CD, WLI is well placed to assist in helping businesses to apply lean manufacturing concepts to their workplaces, and is able to offer Certificate III & IV in Competitive Manufacturing, (MCM30104 and MCM40104). Details of Workplace Learning Initiative's capabilities can be found at www.wli.com.au

Additional sources of general information

There are many semi-commercial sites that offer general information, newsletters, case studies, books and articles on lean manufacturing. Here is a selection.

http://www.isixsigma.com/me/lean_manufacturing/

<http://www.sixsigmasystems.com/>

<http://www.superfactory.com/topics/sixsigma.htm>

Ferret.com is a daily publication that covers the Australian manufacturing sector, with frequent articles and news items on lean manufacturing—<http://www.ferret.com.au/>.

Wikipedia has an excellent article on lean manufacturing and its origins—http://en.wikipedia.org/wiki/Lean_manufacturing

What is lean manufacturing?

Learning objectives

- Recognise a range of lean manufacturing words and understand what they mean in context
- Describe differences between ‘lean’ and traditional manufacturing systems
- Recognise some of the responsibilities that industries now have towards the environment

Key words

Use Resource Sheet 1 to go over some of the key words, making sure that learners understand the four aspects of ‘lean’ mentioned—workflow, mistake-proof, waste, ‘pull’ systems. Other words to check on at this stage (in the Introduction section of the CD-ROM) are listed next. Some of these are mentioned in the Introduction to the CD-ROM.

lean manufacturing

competitive

recycling

root cause

symptoms

environmental

process

Kaizen

defects

continuous improvement

cottage workers

global markets

colour-coding

compost

toxic

Things to do with learners

Ask them to tell you about the changes that Andreas sees at Acme Industries.

Work through the Kaizen questionnaire with your learners, discussing their answers or getting them to ‘interview’ someone else to see what they think.

Make sure everyone understands the difference between a ‘push’ system and a ‘pull’ system.

Ask them to do an ‘audit’ of their workplace—how many ‘lean’ features will they find? Discuss any changes that they think might be possible and how these might be achieved.



Resource Sheet

1

If they haven’t already done it online, work through the activities provided on this Resource Sheet.

Reduce-Reuse-Recycle

Learning objectives

- Demonstrate understanding of RRR concepts and environmental language
- Apply RRR concepts in evaluating the environmental activity of the workplace

Key words

recycle

reuse

sustainable

eco-friendly

environmental

renewable resources

conservation

regulation

non-renewable resources

contamination

breach

license conditions

emissions

footprint

environmental footprint

Things to do with learners

Question the learners about the meaning of key words. Ask them for examples. Revisit new vocabulary frequently until the new words become part of the everyday language of your learners.

Environmental audit

Invite learners to do an audit of the company's environmental awareness. Suggest that they interview key people such as supervisors, buyers, production managers. Do some group work to frame questions about this

workplace and the environment around it—air, soil, water, waste disposal, use of energy, transport, and so on. Some suggestions follow:

- What environmental matters are customers concerned about?
- What changes has the factory made over the last 5 to 10 years to protect the environment?
- What changes are planned for the next few years to reduce, reuse and recycle?

Review some of the changes listed in Resource Sheet 2. Ask learners how many of these practices do they adopt in their private lives.

If they choose to conduct an audit, make sure that a summary of what they did is placed in their folder of evidence for the units MCMT270A—Use sustainable energy practices and MCMT271A—Use sustainable environmental practices.

Company ‘footprint’

Make sure learners understand the concept of an environmental ‘footprint’ (there are some web references in Resource Sheet 2). Then design a small project with the group to calculate the environmental footprint of their workplace. A project report could contribute to evidence of competence for the unit MCMT271A—Use sustainable environmental practices.



Resource Sheet

This Resource Sheet provides some ideas about reducing, reusing and recycling. Ask individuals to search a website each and bring a report back to the group.

Plan-Do-Check-Act

Learning Objectives

- Demonstrate understanding of the Plan-Do-Check-Act cycle
- Apply each stage of the PDCA tool to actual work situations

Key words

fastener

rivet

reduction

kanban

Things to do with learners

Work through the scenario about Jack and Gianni, pointing out that the empty apron hanging on a wall is a form of kanban (signalling).

Explain that there are several versions of the PDCA tool, but that the main idea is that it is a continuous improvement process.

Ask learners to focus on a problem they are having (or have had) at work and lead them through the PDCA cycle. Use some of the following points as ‘prompts’ for questioning and discussion.

- How often does/did the problem occur?
- Could the production team meet with the engineers or technicians to discuss problems?
- How would you test a solution to see if it works?
- Does your team celebrate when it fixes a major problem?

- Will re-training be part of the solution?
- What do the customers say? Are they aware of the problem?
- What are the company's weaknesses and strengths in problem solving?
- Does the company follow each of the steps in the PDCA cycle?



Resource Sheet

3

Remind learners of the Resource Sheet, which lists some useful websites. Ask individuals to do a search and bring a report back to the group.

Kaizen: the heart of 'lean'

Learning objectives

- Demonstrate understanding of Kaizen as team-based continuous improvement
- Name the values underpinning Kaizen

Things to do with learners

Kaizen is not only about making improvements around the factory; it is also about unlocking the knowledge of workers and getting everyone to work together, from the cleaners to the boss.

Ask learners to identify which of the following statements would be consistent with Kaizen and to explain why (or why not).

- New ideas are welcomed
- No one is allowed to do things differently
- Supervisors are in trouble when things go wrong
- Workers have information about their production
- Management promises to make the improvements suggested by the workers, but nothing ever happens.
- Management listens to workers' ideas and puts them into practice
- There are no opportunities for workers to share their ideas
- Workers and managers are always fighting
- Work teams meet regularly to discuss production

- Workers are trained regularly
- Workers are not trusted to do a good job.

Open the Kaizen questionnaire on the CD-ROM. Discuss each question with the group

- What is helping the workplace to move closer to Kaizen?
- What gets in the way of progress towards a Kaizen workplace?

The questions below may help you in this discussion.

How is Kaizen working for you?

- When was the last time someone in the group made a suggestion for improvement?
- What was it?
- What happened to that suggestion?
- What information do members of the group have about the quality of their production? How is quality measured?
- Does everyone know their production goals? What are they?
- Do work teams solve problems together? Tell the story of a problem that your team solved.

Summarise the group's discussion by writing down the next four or five steps needed to improve Kaizen activity at your workplace.

Invite the production manager at your workplace to the next class. Ask a member of the group to present the conclusions of the class discussion to the manager.

The notes from this activity can contribute to the evidence of competence towards the unit MCMS201A—Sustain Process Improvements.



The activities on this Resource Sheet could also be completed and placed in a folder for assessment purposes.

Resource Sheet

4

One-piece flow (or continuous flow)

Learning objectives

- Recognise and use the words associated with the topic
- Explain the concept of continuous flow
- Describe the production process in the learner's own workplace

This topic is complex if applied in a real manufacturing environment. Learners need only a basic understanding.

Key words

queueing

batch processing

WIP—Work in Process

mass production

zero defects

work cell

cellular manufacturing

JIT—Just in Time

one-piece flow

schedule

lean and agile

multi-skilled

Things to do with learners

Discuss the words and their meaning. Are these the words used in your workplace for the same meanings? Ask learners to describe real workplace examples.

Discuss the two forms of manufacturing outlined in the resource sheets, using the diagrams to illustrate. How is production organised in your workplace? Who decides this? Sometimes there are examples of both types of manufacturing.

If there are work cells in your workplace, visit a cell with the group. Talk to the cell members. Ask them about the advantages of one-piece (or continuous) flow set out in the Resource Sheet. Do they agree? Find other advantages and disadvantages of one-piece flow.

Work with the learners to complete the following table. The first one has been done for you.

Batch processing is better when...

making car panels in the Ford
or Toyota plant

because large expensive equipment is needed.

making cast engine blocks

because

powder coating parts

because

One-piece flow is better when...

assembling car radios

because

fitting special orders such as
spoilers and sports tyres,

Because

making small cast parts such
as door handles and hinges,

because



Resource Sheet

There are more activities in the Resource Sheet. You could also ask individuals to search some of the websites listed and bring back a report.

More about waste

Learning objectives

- Demonstrate an understanding of the concept of Seven wastes
- Identify examples of waste in learner's own workplace

Key words

over-production

inventory

over-processing

motion

transportation

defects

waiting

waste

conveyance

reliable

schedule

Things to do with learners

Revise the words and ideas around the Seven wastes, using the mnemonic (memory-jogger) CODWIMP or some other way of remembering. Point out that Motion refers mainly to the *operator* having to move away from the machine to fetch a tool or a component, whereas Conveyance refers to transport of materials and products to and from the assembly line.

Use Resource Sheet 6 to revise the concepts; find more information from the Internet.

Cellular manufacturing

Learning objectives

- Demonstrate understanding of ‘cells’ and the advantages of cellular manufacturing

Key words

cell

batch processing

WIP—Work in Process

brazing

lead time

Things to do with learners

Discuss the example given on the CD-ROM (Automotive Metals). Ask learners to suggest how cellular manufacturing in this example might save money, compared to batch manufacturing. Use the Seven wastes to prompt their thinking.

Find a family of products that are made in your workplace—a ‘family’ would share equipment and some processes.

Identify a mass produced (or batch processed) item or a family of items that could be changed to continuous flow production, using cells.

- Discuss the advantages and disadvantages of changing to cellular production.
- Draw a production cell for this product and name the processes at each work station.



Use the Resource Sheet to discuss advantages and disadvantages of cellular manufacturing. Why are cells more common in 'lean' enterprises?

Resource Sheet

7

Mistake proofing (poka-yoke)

Learning objectives

- Explain the concept of mistake proofing and demonstrate understanding with examples
- Identify points in a production process or in ordinary life environment where poka-yoke would be useful

Key words

TQM

baka-yoke

infra-red scanner

circuit breaker

Things to do with learners

Find examples from the home where poka-yoke mechanisms are in place to prevent errors, for example—kettles that automatically switch off once the water boils, refrigerators that beep when the door is left open.

Find examples from the workplace where mistake-proofing mechanisms are used to prevent errors. Ask individuals to visit John Grout's website and bring back examples for discussion. Ask whether poka-yoke is mainly for engineers or whether ideas for preventing errors sometimes come from the shop-floor.

Ask learners to identify points in the production process where mistakes occur. Ask supervisors and production staff to assist, if possible. Select one mistake area that could be eliminated with a poka-yoke solution (it doesn't have to be mechanical or electronic).

Brainstorm suggestions. The solution may be too difficult to make but you may be able to design it. Talk to workers doing the job, the supervisor and management to test the value of the idea.



Follow the web links on the Resource Sheet and print out some of John Grout's examples for discussion. Enterprising learners might even enter John's competition for good poka-yoke solutions.

Resource Sheet

8

Saving energy

Learning objectives

- Identify sources of energy used in a manufacturing workplace
- Describe strategies for reducing energy use

Things to do with learners

You should cross-reference this topic with the Reduce–Reuse–Recycle material (Resource Sheet 2) and emphasise the environmental as well as the financial benefits of reducing energy use.

The activity in Resource Sheet 9 asks learners to find information from the factory office and from workplace managers. The task may be difficult for workers to do on their own. Look at these activities again. Even if they have already done the activities, the group will have new information to enrich and deepen their first explorations of the topic. However, it may be best to start with an overview such as the activity below.

What types of energy does your factory use? Give at least two examples

Energy	Examples
Liquid Petroleum Gas (LPG)	
Natural Gas	
Electricity	

Energy

Examples

Petroleum

Diesel

Other



Resource Sheet
9

This Resource Sheet includes a learning activity that can be printed out and placed in a folder for assessment purposes. Activities in this topic relate directly to the unit MCMT270A—Use sustainable energy practices.

Customer first

Learning Objectives

- Describe positive ways to deal with customer complaints
- Recognise the customer-driven nature of lean manufacturing

Key Words

complaint

internal customer

External customer

complaints-handling system

customer satisfaction

customer loyalty

return business

Things to do with learners

Ask the group to give examples of when they had complaints that were handled well or handled badly. How did group members react in each case? What was the impact on their customer loyalty?

Below is a case study. Read it through with learners and identify what the manager did correctly. Refer to Resource Sheet 10 for guidance.

Case study—Solve my problem now!

An angry woman marched into a plumbing company's head office. Mrs Vados was her name. She demanded to see the manager about an unfinished plumbing job. She was looking for a fight. But she had a reason to be angry. She had asked many times for the plumbing to be

fixed for her daughter's wedding party next week. Now there were only two days to go.

The manager, Carlos, invited her into his office and allowed her to express her anger. He showed a real interest in her situation and agreed that having leaky pipes in the toilet would be a problem. He then calmly explained the reasons why the job had not been finished—there had been heavy rains and the plumbers were busy with many emergency plumbing jobs. In fact, a young couple nearby had their whole house flooded.

He then picked up the phone to Marco, the plumber handling the job. He told Marco that both he and Mrs Vados wanted the job finished by the weekend. Marco explained that he had four jobs that day and they were all emergencies. Carlos stated that this was also an emergency. He suggested that perhaps Marco could patch up the pipes for the weekend and return the following week to finish the job properly? The plumber thought about this for a minute and then agreed, he could temporarily stop the leaking for a couple of days and then fix it properly next week.

Carlos put down the phone and explained the plan to Mrs Vados. She was very pleased. No, she didn't mind the plumber coming back next week to do the job properly, just as long as he could stop the ugly streak of dirty water leaking from the back of the bathroom toilet. Carlos promised. There would be no leaking pipes during the wedding party.

Mrs Vados left the office feeling satisfied. The company saw that her problem was important and had solved it. When Marco arrived the next day he gave Mrs Vados a fridge magnet with the company's phone number on it. She immediately placed it on the fridge. Guests at the wedding party noticed it and commented on it.

—from NSW Department of Fair Trading—:
<http://www.fairtrading.nsw.gov.au/business/runningabusiness/handlingcomplaints.html>

Ask learners about their company's complaints policy and procedures.
Could the policy and procedures be improved?



Use the web-site references listed at the end of the Resource Sheet to get ideas to improve the company policy or to design a complaints-handling system (headings only) that would improve customer relations.

Resource Sheet
10

Brainstorming

Learning Objectives

- Explain principles of brainstorming
- Participate in brainstorming activities within the work environment

Things to do with learners

Some useful rules for brainstorming may be found in Resource Sheet 11. Ensure that learners understand the principle of going around the table in turns and that outrageous or ‘wild’ ideas are permitted, even encouraged.

Brainstorming works best when you are looking for new ideas and it is useful to start the process with a ‘What if...?’ question.

- What if the canteen sold Asian and Middle Eastern food?
- What if the factory closed for the Christmas break?
- What if we added a night shift?
- What if the team chose its own leader?

Ask learners to conduct a brainstorming activity with the learner group or work team. Find a topic that is important to the group and the workplace.

Include any brainstorming notes in the folder of evidence for learners seeking a formal qualification.



This Resource Sheet outlines what brainstorming is and how to run a brainstorm. Ask learners to check out the websites and bring back an alternative tool for stirring up good ideas.

Resource Sheet
11

Problem-solving tools

Learning objectives

- Describe a range of problem-solving tools described and explain when to use them

Key words

8D	Spaghetti Map	checklist	floor layout
OH&S	process improvement	work flow	root cause
analyse	quick fix	Pareto	run chart
4M	trial solution	implement	measurable

Things to do with learners

Ensure that learners understand the problem-solving vocabulary used on the CD-ROM and if necessary remind them of the ‘hot words’ they can click on the screen for a pop-up explanation. Practise ‘linking’ some of the words above, for example— ‘A trial solution was implemented after the root cause was found’.

A story about problem solving

In the story below, use the lean manufacturing words to describe the events and stages of the problem solving activities.

Lou’s Automotive is a company that looks after imported cars and prepares them for sale at different car dealers throughout the country. When the cars arrive, they are taken from the ship and stored in the yard.

Sometimes they need to be repaired because they were damaged on the ship. Before they are sent to the dealer, the accessories are fitted according to the customer's order. Most have radios and CD players fitted, some have spoilers and special stripes and decorations.

One of the problems at the yard is that the cars run out of petrol. A small amount of petrol is put in the cars when they arrive so they can be driven to the workshops and onto the truck for transportation. The company does not want to spend too much money on petrol, but when the cars run out work has to stop. The workers have solved the problem with a petrol can. They add the petrol by hand but the cans are heavy, particularly when they are full. The workers have to lift the can and hold it at the height of the petrol cap, so there are safety problems. It is difficult not to spill petrol on the car so sometimes the cars are a little damaged. The workers use up valuable time replacing the petrol. It takes much longer to replace the petrol by hand than to fill it at the petrol pump.

The yard workers got together to think of a better solution. They measured the amount of time they spent in a week replacing the petrol by hand. They figured out the cost of that time in workers' wages. It came to \$93 per week in workers' wages. They added the OH&S risk to the workers and the paint damage from the spilled petrol. If no cars needed to be filled by hand in the yard, the company could spend \$4.00 more on petrol per car in the yard. They could then release one worker from the yard team for two days per week. That worker could help in the work sheds.

The team tried their idea. It worked for the most part. The cars were filled from the petrol pump and the company had an extra worker for 2 days a week as well as reduced risk from safety problems. However it did not work for all the cars. Some needed more than the \$4.00 of petrol.

Encourage your learners to tell their own problem solving stories from their workplace. Were the problems solved? Did the workers use a problem-solving tool? Which of the tools above could have been applied?

Ask learners to conduct a 4M analysis of a work station. Use the questions from the 4M section in Resource Sheet 12 to help you.



Resource Sheet

12

This Resource Sheet has a lot of information about problem solving. Suggest that learners complete the learning activities in the Resource Sheet and place these in their assessment folder as evidence for the following units:

MCMS201A—Sustain process improvements

MCMT280A—Undertake root cause analysis

Sustainability

Learning objectives

- Demonstrate an understanding of sustainability principles
- Apply the concept in limited terms to the home and the manufacturing environment

Key words

sustainable

pollutant

pollution

energy

carbon neutral

CO²

greenhouse effect

biodegradable

environmentally friendly

land fill

environmental impact

recyclable

conservation

carbon

carbon trading

emissions

renewable energy

This topic is very complex because of the scientific concepts involved, so you need to keep it as simple as possible. However, the words above are essential in reading about the topic. It may be useful to work with your learners in looking at the material on the websites. The websites selected in the Resource Sheets are some of the easier sites to understand, even though they include scientific concepts.

Things to do with learners

Ask learners to list and describe any initiatives the workplace has undertaken, (or plans to undertake) to reduce its environmental impact. The company engineer should be able to help and there may be brochures, posters, policy documents, etc

Ask learners about the packaging of products leaving your factory. How environmentally friendly are they? Can they suggest alternative packaging that would reduce the environmental impact. Ask the learners to investigate the costing of their suggestions and rehearse how they might present their ideas to the management.

Ask management about any emissions from the factory. Have there been moves to reduce or modify them? Study the design of the chimneys, etc. How do they assist in reducing emissions?



Resource Sheet
13

This Resource Sheet has information about global warming and the greenhouse effect. It also explains something about biodegradable products and ‘food miles’. The exercises in the Trainer Guide will assist learners looking for evidence to put in their folder. Make sure they take notes of discussions with management and suggestions for environmental improvement.

Cost Components

Learning objectives

- Demonstrate understanding of the cost of manufacturing processes
- Gathering information about cost components from the workplace

Key words

superannuation

levy

wages

salary

workers compensation

insurance

Workcover

tax

competitive edge

charges

Things to do with learners

Invite the company's accountant to speak to the group. Before he or she arrives, prepare questions with the group for them to ask. Find out what are the major costs for the company.

- What costs could be reduced most easily?
- Find out the cost of staffing the workplace.
- Compare the cost of employing casuals with that of on-going staff.



Resource Sheet
14

This Resource Sheet looks at traditional ways of calculating profit and compares these to 'lean' methods. It also has a breakdown of expenses based on the figures of a real workplace. This may be a useful guide when talking to your accountant. Guide the learners in making notes from the discussion with the accountant. Add these to their folder of evidence.

Takt time/cycle time

Learning objectives

- Demonstrate ability to interpret graphs
- Explain the difference between takt time and cycle time in an industrial environment

Key words

takt time

cycle time

lead time

axis

vertical

horizontal

Pareto chart

bar graph

run chart

pie chart

graph

chart

scale

assessment instrument

tool

Things to do with learners

Learners sometimes have problems when reading graphs and mathematical information. Here are some suggestions to help them understand the basics.

Many people, including learners, get confused about the difference between decimals and minutes and seconds. You might like to compare the values of 1.5 minutes (one and a half minutes or 90 seconds) and 1:50 (one minute and fifty seconds). It may be useful to look at the convention of using a colon (:) for time—hours, minutes and seconds—compared to

the decimal point. What is used in your workplace? Ask the question, which would take longer—1:40 or 1.4 minutes? How many seconds are there in each total?

Graphs for beginners

Using the graphs, get the learners to add intervals of 1 to the scale of 5 second intervals.

Find the labels for the vertical axis a horizontal axis. What would the graph look like if time was put on the horizontal axis?

Why is this chart a bar graph rather than a pie chart? What would it look like if it was a pie chart?

What would it look like if it was a Pareto? In this example, a Pareto chart would not be useful. Why not?

For more advanced learners

There are probably many graphs around the factory. Give a copy of one to each learner. Ask them to tell the story of the graph.

Find out the cycle time, takt time and lead time for products at your company. The supervisor or production manager should be able to help with this information. This may be an opportunity to invite the relevant manager to the class to discuss these concepts, how they are calculated at the factory and how they are used in quoting prices to customers. Find out how much time they allow for down time when calculating takt time.

Calculating cycle time and takt time

Working as a group, choose a product that does not have many processes and is as simple as possible in its production.

Ask learners to list all the processes that take place at the factory to manufacture this product. This is an opportunity for them to practice flow diagrams.

Advise them to take a stop watch (or mobile phone) and calculate the cycle time for the whole operation.

Do their calculations agree with those quoted by management?

Refer to the CD-ROM's definition of lead time. What is the lead time and could it be improved? Where are the hold-ups?

Is there wastage in this process? Where is it and how could it be eliminated?

Write a brief report with the group. Discuss the headings you might use for the report. The Six step problem-solving headings may help or the following headings might be more useful:

Objectives—what are you trying to do and why are you trying to do it?

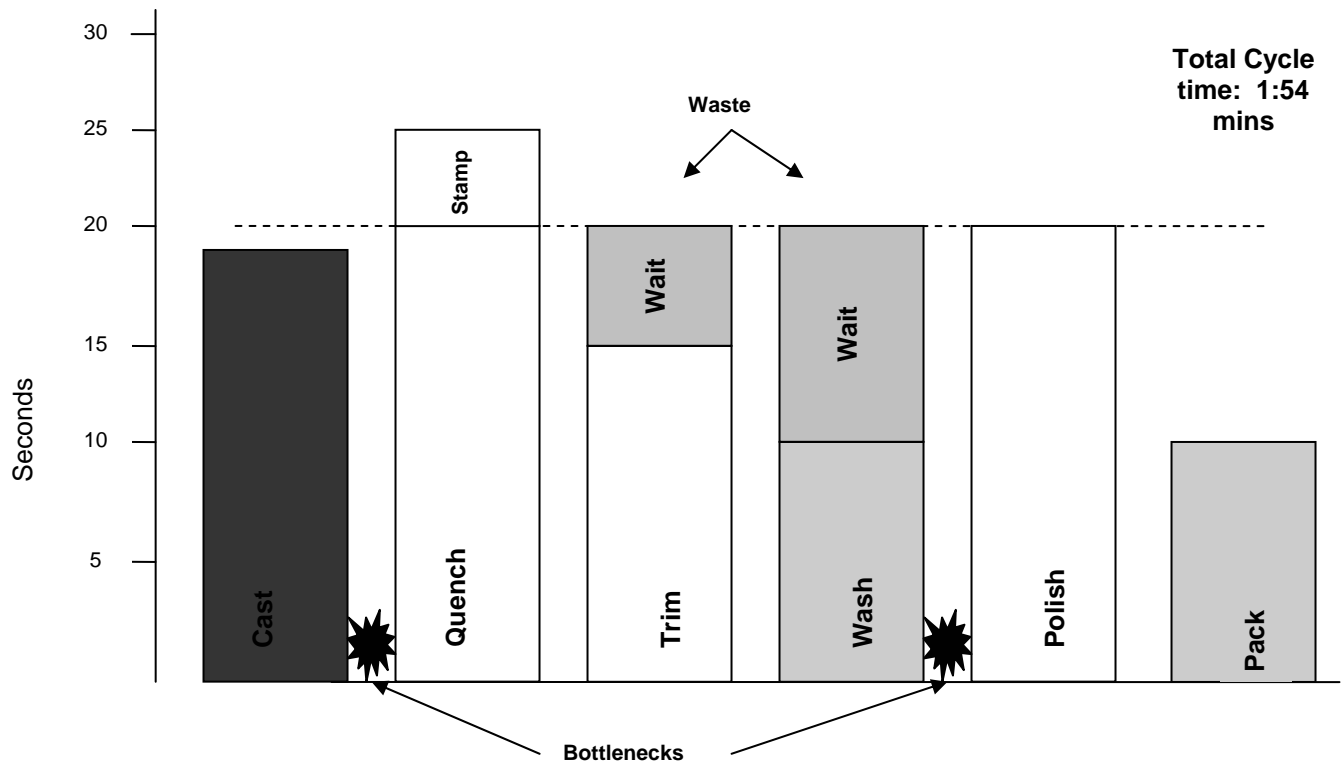
Background—discuss the events that led to writing the report. Include what you did and what you observed. Prompt learners with questions of 'what', 'when', 'where', 'how', 'why'. Use facts rather than assumptions.

Options and Action—this is where you make your suggestions to solve the problems you have exposed above. This may involve money—new equipment or materials. The group will need to research this to make sure they are not suggesting something that is not do-able.

Review—this is where you discuss how your new idea could be put into practice and how difficulties could be managed.

Invite management in again and have the group discuss their suggestions with the relevant manager.

You may also like to work through this example with the learners.



In this diagram you can see the cycle time for each operation as well as the total cycle time. The waiting time is included so that the whole production time, at the moment, is 1 minute 54 seconds (1:54 or 114 seconds). If there are no improvements on that time, this factory can make 240 parts per day working 7.6 hours per day. This is easy to work out—ask learners how many seconds there are in 7.6 hours (answer: 456 minutes multiplied by 60 seconds = 27,360) and then divide by 114 seconds (1 minute 54 seconds) to find out how many cycles can be completed. Here we expect that there is no downtime and that workers are replaced during meetings etc.

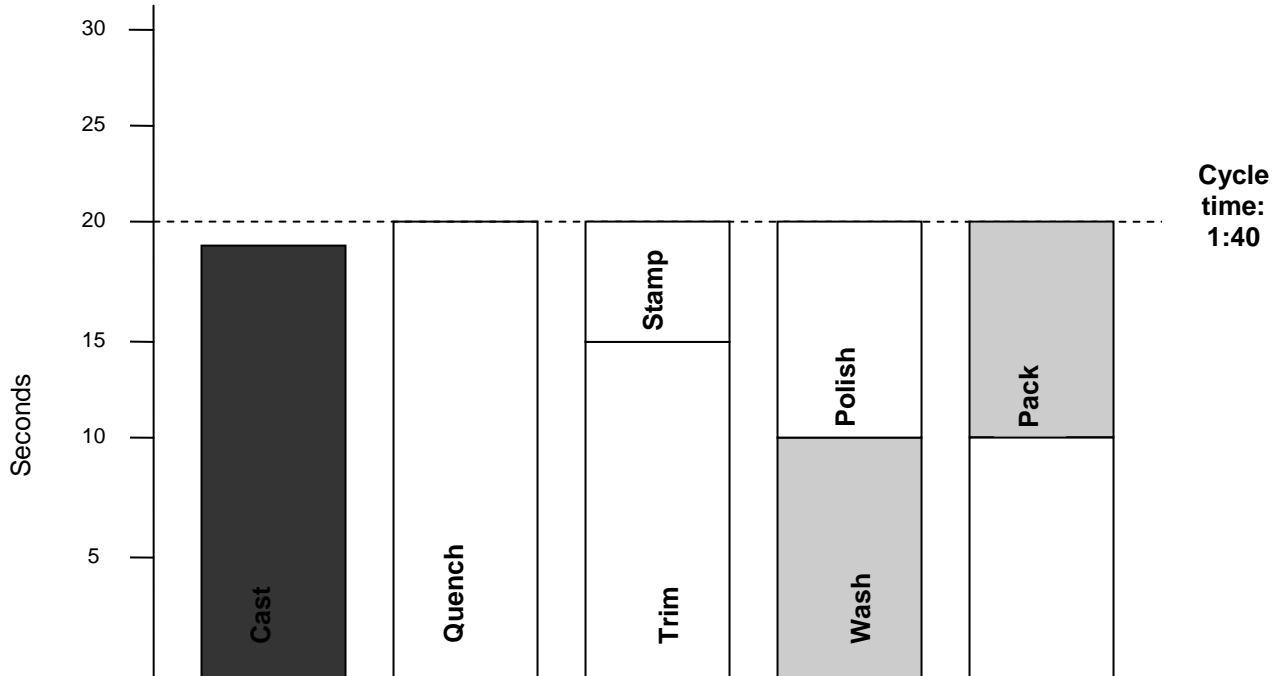
Now let's look at takt time.

Takt is German for rhythm or beat. It tells us how fast the line needs to go to get the products to the customer on time. Let's say the customer

wants 500 parts per day. Then we need to set up the line to produce that number each day.

The cycle time will tell us how many operators we need to reach the target. Sometimes the machinery will not be able to produce enough parts during one shift. It may be necessary to add a night shift. In the example above, we will need more than two full shifts to meet the customer requirements of 500 parts per day. But if we could eliminate the waiting (14 seconds), we could get cycle time down to 100 seconds (1:40 mins). That means we could make 273 parts per day in one shift and manage 500 parts with a night shift as well.

This of course would affect our takt time. We need to match the beat or pace of production to customer demand. In the diagram the processes have been balanced.



Point out that takt time at Toyota is based on all machinery operating at 100% efficiency during regular working hours. Refer learners to Resource Sheet 15 and work through the examples shown.

Ask what would happen if we added an extra task—let’s say, a worker takes another five seconds to attach a knob to the product before packing it. What is the new cycle time?

Ask learners to redraw the diagram on the previous page to include the assembly task.



This Resource Sheet gives you the definitions of takt time and cycle time. It also offers questions to investigate regarding the use of these concepts in your workplace and a few websites to explore.

Resource Sheet
15

Root Cause Analysis

Learning objectives

- List a range of problem-solving tools
- Explain why Root Cause Analysis is more effective than other problem-solving methods
- Identify examples in the workplace where Root Cause Analysis could be applied

Things to do with learners

Find a story of a complex problem that was solved in the workplace. Discuss the steps that were taken to solve the problem. Look back at the Root Cause Analysis diagram on the Resource Sheet. Using the diagram, ask the learners to name the steps in the problem solving process, explaining why RCA uncovers ‘deeper’ reasons for a problem. Point out that we always need to consider what was going on in an operator’s mind when something went wrong. Was there a distraction? Did the operator mis-hear an instruction? etc

Discuss challenges and problems around the factory. Ask what tools could be applied to find out more about the situation and to improve production. Ask how Root Cause Analysis is different to other problem-solving tools.

Work through the diagram provided in Resource Sheet 16.



This Resource Sheet provides a list of problem-solving tools that you can work through with learners. Any worked examples they have done should be included in their folders for the purposes of assessment.

Resource Sheet

16

Visual Factory

Learning objectives

- State the advantages of effective visual information in a manufacturing workplace
- Explain how the Visual Factory and 5S are complementary aspects of the 'lean' environment
- List examples of the Visual Factory

Things to do with learners

Work through Resource Sheet 17 with your learners. Ask them to visit some of the websites listed, to print out examples of Visual Factory and to explain why the picture or graphic is more effective than printed or written words.

Invite learners to use their mobile phone or digital camera to collect images from their workplace that convey clear and effective messages without having to use words.

Ask about the cultural and linguistic diversity in the workplace. How does the Visual Factory overcome cross-cultural communication problems?

Ask learners to look for a step-by-step process that consists entirely (or nearly entirely) of pictures rather than words. How does this visual presentation save time and avoid misunderstanding?



This Resource Sheet provides further examples and activities on Visual Factory in your workplace.

Resource Sheet

17

More about 5S

Learning objectives

- List each stage of 5S and explain its relevance to lean manufacturing
- Evaluate the progress of 5S in your own workplace

Things to do with learners

Remind learners that 5S was one of the topics in the first CD-ROM, *Lean Manufacturing: Solving problems, working together*. Ask them to explain what each 'S' stands for and whether the system has been implemented yet.

Use the chart provided in Resource Sheet 18 to evaluate progress and determine the level on which their workplace now sits. Why are 5S and Visual Factory often found together?

Do learners use 'red tagging' for equipment, tools etc that are no longer required? Is there a system of retrieval/disposal? How often is this process done? Does everyone understand the 5S system or is it only being practised by a few? If this is so, what needs to happen for everyone to take part, including office staff, managers, owners, visitors, suppliers...

Evaluating progress

Look at the activities in the Resource Sheet. Ask the learners to complete the workplace assessment on their own. When they have finished, compare the different answers and find out why they rated the workplace differently. Ask learners for examples of 5S in their workplace. Ask learners to discuss the system with other workers and supervisors in their

area. What are the advantages and disadvantages from their point of view?

Compare their answers with the advantages listed on the website reference: <http://en.wikipedia.org/wiki/5S>

Ask learners why they think that most people find ‘Sustain’ the hardest stage of all.

Invite learners to use Five Whys to find out:

- Why tools and equipment have not been put away
- Why clean-up schedules have not been followed.



This resource sheet provides an evaluation table for learners to check on 5S in their workplace. Remind them to put a copy of the completed evaluation in their assessment folder.

Resource Sheet

18

Force Field Analysis

Learning objectives

- Explain how Force Field Analysis may be used to bring about change in the workplace

Key words

balance

analysis

guesswork

forecasts

data

driving forces

brainstorm

imbalance

restraining forces

Things to do with learners

Look closely at the Force Field diagrams in Resource Sheet 19, ensuring that learners understand the basic ideas. If necessary, refer to the case study on the CD-ROM (Tuff-Stuff Adhesives—Ernest wants to lose weight).

Select a change that learners would like to see happen in their workplace. Use Force Field Analysis to identify driving forces and restraining forces. Ask why many people are so afraid of change and may invent all kinds of strategies to resist it. Imagine some of the expressions they might use, such as:

- ‘What will they think of next?’
- ‘That will never work here’
- ‘Why fix it if it’s not broken?’
- ‘I wonder who dreamed up this idea.’

In your discussion you might point out that people don't like change if it is going to affect them adversely; but they do like change that makes things better for them. Moreover, most people don't like change that comes too quickly, because this makes them feel out of control.

However, people *will* accept change when they believe it is necessary or better for others or if they agree that there is a problem to be solved. Most people accept change when they have been involved in planning it.

As an example, ask learners to consider any forces that may be preventing the Reduce–Reuse–Recycle principles from being fully introduced in their workplace.

As a group, identify forces for and forces against and consider how you might strengthen the former and weaken the latter.

Use the Brainstorming tool to find ideas for strengthening and weakening the two forces. You might even imagine a situation where the forces against change get even stronger. Put a number from 1 to 4 against each force to show its strength or weakness, before mapping them onto the blank diagram provided in Resource Sheet 19.

Other people will have different opinions, particularly about the scores. It is good to talk with others and to reach some kind of consensus. Point out that this is another advantage of the tool.



Resource Sheet

This Resource Sheet includes a learning activity that can be printed out and placed in a folder for assessment purposes.

APPENDIX—Competency mapping table

Unit of Competence

MCMC201A – Sustain process improvements

- Implement corrective actions
- Check changes
- Check for further improvements

MCMT280A—Undertake root cause analysis

- Recognise problems
- Implement quick fix
- Determine root cause
- Develop permanent solution

Section on CD & Topics

Introduction—Acme Industries
Kaizen Café
Kaizen questionnaire

Tuff Stuff Adhesives

Eco-furniture
Problem solving
Problem solving quiz

Dynamic Die Casters
4M checklist
4M activity

Resource sheets

3—Plan-Do-Check-Act
4—Kaizen
6—More about waste
8—Mistake proofing
18—More about 5S
19—Force Field Analysis

3 Plan-Do-Check-Act
8—Mistake proofing
11—Brainstorming
12—Problem solving tools
16—Root cause analysis
17—Visual Factory
19—Force Field Analysis

Unit of Competence

MCMT231A—Interpret product costs in terms of customer requirements

- Identify cost components deriving from customer benefits and other costs
- Compare required performance of product or process steps with actual performance
- Minimise waste

Section on CD & Topics

ALL five case studies focus on cost reductions to meet customer requirements.

Introduction

Quick history of lean manufacturing

Automotive Metals

Lean Costing

Lean Costing Activity

Seven wastes

Working in cells

One-piece flow quiz

Green journey

Green journey processes

Green journey resources

Crossword puzzle

Dynamic Die Casters

Overview

Crisis,crisis (1 & 2)

Lowering costs

Lean ways to lower costs

Lean methods quiz

Resource sheets

5—One piece flow

6—More about waste

10—Customer first

14—Cost components

15—Takt time/cycle time

18—More about 5S

19—Force Field Analysis

Unit of Competence

MCMT270A—Use sustainable energy practices

- Identify energy use
- Follow energy conservation plans
- Improve energy use

MCMT271A—Use sustainable environmental practices

- Identify resource use
- Comply with environmental regulations
- Follow resource conservation plans
- Improve resource use

Section on CD & Topics

Sustainable energy practices are ‘built into’ most of the case studies.

Introduction—Acme Industries

Automotive Metals

Green journey
Green journey processes
Green journey resources
Crossword puzzle

Eco Furniture

Tuff-Stuff Adhesives

Sustainable environmental practices are ‘built into’ most of the case studies

Introduction—Acme Industries

Automotive Metals

Green journey
Green journey processes
Green journey resources
Crossword puzzle

Eco-furniture

Sustainable design
Materials quiz

Tuff-Stuff Adhesives

Resource sheets

2—Reduce, reuse, recycle
6—More about waste
9—Saving energy
13—Sustainability

2—Reduce, reuse, recycle
6—More about waste
9—Saving energy
13—Sustainability