PRODUCTIVITY, EFFICIENCY & QUALITY

CHAPTERS FROM THE BUSINESS TOOLKIT

This is only two chapters of the toolkit. You can download the full document or any of the other chapters from the Partner Africa website.
www.partnerafrica.org/business-toolkit

WELCOME

This toolkit provides practical assistance on how to improve ***Productivity, Quality and Workforce Management – areas which are inextricably linked.*** People are a core and valuable asset for every business and in order to have an efficient, productive business, employees need to work in good conditions. Partner Africa, through its extensive auditing, training and consulting work have found that workers who are safe, respected and content in their work are more efficient and productive. For instance, productivity is increased by reducing the need for sick days and constant recruitment and onboarding due to high worker turnover. The connection also flows in the other direction: as productivity and efficiency improves, there are opportunities to improve wages and reduce excessive working hours without impacting price.

Productivity, Quality and Workforce Management are all essential elements to building a lasting business and a strong partnership with purchasing companies into the future.

The group of companies and organisations behind this toolkit want to share best practice and learning across the industry. This toolkit gives suppliers practical assistance on how to improve productivity, quality and workforce management in production sites. It will enable you to understand each issue and why it matters for your business, what is required, what that means in practice and will also enable you to assess your current situation and provide you with practical tools to make the necessary improvements.

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Partner Africa
Ethical Solutions in global trade

Produced by Partner Africa for The Cola-Cola Company, Diageo, ABInBev and Aim-Progress

THE BUSINESS TOOLKIT CONTENTS

The content of this Toolkit was developed by Partner Africa and consultants, in conjunction with the participating brands. Each company may have additional and/or specific requirements on the topics covered in this document and thus this Toolkit should be utilised as a reference guidance only.

1. PRODUCTIVITY AND EFFICIENCY

WHY THIS IS IMPORTANT TO YOUR BUSINESS

Productivity is described as *doing more with the same*, and focuses on the *output* – how to produce more goods or services with the same amount of input (time, labour, materials and machines).

Efficiency, on the other hand, can be described as *doing the same with less*, and focuses on the *input* – how to produce the same number of goods or services, using less resources. In rare cases, especially when leveraging technology, you can improve both productivity and efficiency at the same time – *doing more with less.*

A competitive market demands continuous improvement in both productivity and efficiency. The rate of development of technology means there is always someone asking 'how can this be done better / cheaper / faster' and in order for a business to ensure longevity, a culture of doing more with less must prevail.

Productivity and efficiency improvements should therefore not be seen as a once off goal, rather a way of doing business in order for a company to stay competitive, be sustainable and grow.

WHAT THIS MEANS IN PRACTICE

These sections have been designed as a practical guide for any business to improve their productivity and quality.

A competitive market demands **continuous improvement** in both productivity and efficiency.

THE **EXPECT**ATIONS

Your business needs to be aware of the current productivity and efficiency levels through measurement of key indicators (throughputs / material usage / labour utilisation / waste etc).

Your business needs to be actively working to improve the productivity and efficiency levels within the business by means of continuous improvement and active problem solving.

WHO

The ethos of continuous improvement must be engrained throughout the organisation, from the most senior manager to the entry level employee, including line supervisors, factory managers, HR practitioners and all supporting services.

Waste reduction and process improvement should be an ongoing conversation in every aspect of the business – those directly involved with the product / service as well as supporting services who enable effective delivery of the final product.

WHAT THIS MEANS IN PRACTICE

We recommend that these sections are applied in conjunction with your existing ISO certifications (if applicable).

In improving productivity and efficiency, we need to consider what to build/ improve and what to remove:

What to *maximise* and build into the production process:

Capabilities (what we do, processes and systems) and **Resources** (what we need to deliver the product). Strengthening these processes and making efficient use of these resources is central to productivity and competitive advantage. This can be broken down into the 5Ms.

- **Methods (processes and systems)**
- **Manpower/people (workers/team)**
- **Machines (machinery, tools, equipment, facilities)**
- **Materials (inputs for production, raw materials, packaging)**
- **Measure (measuring productivity, quality, time, costs)**

What to *remove* from the production process:

Bottlenecks/Delays - A bottleneck is a constraint in a production process that causes delays and determines the capacity of the rest of the system. By identifying and addressing bottlenecks, the overall capacity of the system increases and your business becomes more productive / efficient, reducing unnecessary cost.

Waste – Anything in the production process that does not add value to the customer is waste. Identifying and reducing or removing unnecessary waste is central to achieving operational efficiency. Waste can be *transactional* (paperwork, office equipment, computers, reports) or on the production floor. This document focuses on *production floor* wastes as it is a practical toolkit for increasing productivity in production rather than the management/office functions of the business. Waste can be categorised into 7 sections:

- **Transportation** – moving goods from one location to another (within a factory, or to customer)
- **Inventory** – raw materials / inputs, work in progress and finished product. There is inherent costs associated with holding, storing and handling inventory
- **Motion** – unnecessary movement of people or machines
- **Waiting** – for work / inputs / information to arrive (from both workers to managers, and managers to workers)
- **Over-Processing** – adding more value to the product than required by the customer. This is mostly due to a lack of clear standards and processes
- **Overproduction** – producing more than is required, or producing it too soon before it is required
- **Defects** – products or services that do not meet customer requirements

The diagram below gives you an overview of the whole Productivity chapter, how the different sections fit together and how it flows as a whole process. By following the *Review, Analyse, Improve* method, teams can continuously improve their capabilities to drive productivity, and eliminate waste and bottlenecks.

PRODUCTIVITY

CHAPTER OVERVIEW

REVIEW

• Find out where you are at now
• What are the areas for improvement?

1 CHECKLISTS
USE THE CHECKLISTS
Identify key areas for improvement

2 PROCESS
DRAW A PROCESS FLOW DIAGRAM
Use this diagram to identify where in your process there is room for improvement

3 MEASURE
METRICS AND DATA COLLECTION
Improve data collection to better understand the current situation

A clear understanding of existing issues, their extent and where they are occurring

ANALYSE

• Identify where to start
• What are the root causes?

4 PRIORITISE
PRIORITISE WHERE TO START
Pareto process

5 ROOT CAUSES
UNDERSTAND THE ROOT CAUSES OF THE ISSUE
• 5 Whys • Fishbone

You have a list of top priority issues to tackle and an understanding of why they occur

IMPROVE

• Decide which tools will help for the issues identified
• Manage the improvement process

6 MANAGE IMPROVEMENTS
KNOW HOW TO MANAGE THE IMPROVEMENT PROCESS
• Action plan tables • PDCA cycle

7 TOOLS & TIPS
CHOOSE TOOLS AND TIPS TO TRY
based on where your priority issues are

7.1 MANPOWER
• Communication and team work
• Skills and remuneration
- Piece rate
- Bonuses/ incentives

7.2 MACHINES
• OEE

7.3 DELAYS
• Line balancing
• Downtime

7.4 WASTE
• 5 S model

1.1 REVIEW: CHECKLISTS

This section explains the details of what this means in practice and can also be used as a tool to self-assess your site. Put a ☑ if you think that point is in place in your business and put a ☒ if it isn't or needs improvement. You can then create an action plan, to assign and follow up an action for every ☒. (sample action plans are given at the back of the toolkit).

CAPABILITIES/RESOURCES (5MS)

METHODS

- ☐ We understand what differentiates our business from competitors and we look to strengthen those capabilities
- ☐ Our systems and processes are looked at regularly to see if they can be improved
- ☐ We consult with others to review our methods and processes
- ☐ We get feedback from workers who actually use the processes, on how they can be improved
- ☐ We have identified areas where our business needs to improve in order to remain competitive
- ☐ We often ask: Why do we do it that way? How can we do this better? Why is this necessary? Can multiple steps be turned into one? Could a new technology make this more efficient? (We are not afraid to challenge and change the 'status quo')

MACHINES

- ☐ We have machines which are fit for purpose
- ☐ We have operators with the required skills to maintain and keep these machines in good working order
- ☐ We measure the effectiveness of each machine and know which of our machines are reliable and which need to be replaced
- ☐ We know the manufacturers design capacity of each machine and are operating close to that design capacity
- ☐ We continue to update our machinery and equipment to keep up with advances in technology
- ☐ Machinery and equipment is maintained according to a proper maintenance schedule
- ☐ We have a backup if a key piece of machinery breaks down

MANPOWER

- ☐ Workers are trained and skilled for the jobs that they do
- ☐ We are confident that we have the right people in the right jobs
- ☐ We provide on-site training to ensure that we maintain good skill levels in our teams
- ☐ We understand what rate of work (e.g. kg / hour, packs per minute) a skilled person can achieve
- ☐ We have clearly defined, measureable targets for new employees which must be attained in a certain time period
- ☐ Workers are aware of the target rate of work
- ☐ We know who our star performers are and they are recognised
- ☐ We have systems in place to listen to the frustrations of workers and attempt to resolve them
- ☐ Workers know what the planned target is for the day
- ☐ Workers know throughout the day if they are achieving this target
- ☐ Feedback is provided on the previous days' performance and any issues from the previous day are addressed today

MATERIALS

- ☐ We are confident that we are using the most suitable materials for the job, materials that add value to the product, according to the customers' requirements
- ☐ We ask whether there are alternative materials which can offer us a similar / better quality at a lower price
- ☐ Goods are stored in appropriate clean areas, so that spoilage/ damage is rare

MEASURE

- ☐ We understand and measure how productive / efficient we are at each stage of our process and are continuously looking to improve this
- ☐ The resources required to produce a single product are measured, and we work to maintain or improve on the use of these resources
- ☐ The time each product spends at each stage of production is measured, and we work to maintain or improve those times
- ☐ We are able to compare how production units/workers/ sections perform in relation to one another

BOTTLENECKS/DELAYS

- ☐ There are no workers or workstations waiting excessively long for the next task (this would mean that there is a bottleneck before them in the cycle)
- ☐ We seldom / never need to stop production due to excessive pile up at one station
- ☐ If any workstation has a pile up of inputs or inventory, we understand why this has occurred and this is addressed so it does not happen again
- ☐ We measure the number of delays / stops which occur and actively work to reduce these
- ☐ We are able to achieve consistent throughputs within the system, rather than erratic performance from one hour to the next
- ☐ We balance our resources to the capacity of our facility, with workstations looking very similar each day
- ☐ We understand the capacity of each work station and provide adequate resources (people, raw material) to ensure the product line remains adequately balanced
- ☐ In general, workers are productive during the day – working consistently at the required speed
- ☐ All machines operate at the manufacturers design level (if there is a machine operating above the design capacity, it runs the risk of breakdown and therefore causing prolonged delay)

WASTE

TRANSPORTATION

- ☐ Transport to and from the facility (deliveries, worker transport etc.) takes the shortest route possible
- ☐ Product is never / seldom lost due to transportation concerns (for e.g. breakdowns / theft / stock control)
- ☐ Deliveries take place during off-peak traffic, reducing delivery time but without negatively affecting production
- ☐ Our delivery vehicles make use of full loads, rather than half loads
- ☐ We measure and understand the cost (typically cost / kg) to deliver goods and actively seek ways to reduce this
- ☐ Workers and workstations are situated close to the inventory supply (store room or previous work station), eliminating unnecessary movement
- ☐ Workers do not have to make unscheduled trips to collect tools or inventory
- ☐ The delivery of resources to the production floor is not carried out by skilled workers who are better utilised in production
- ☐ Production is seldom / never delayed due to interruptions in the transport of goods
- ☐ Enough time is provided for the transportation of workers to allow for the occasional mishap without having an impact on production

INVENTORY

- ☐ We have traceability of inventory to understand stock movement
- ☐ We seldom or never need to dump raw material or packaging which has expired
- ☐ We know the value of stock which was dumped, the reason for this (for e.g. expired stock) and work actively to reduce this
- ☐ We undertake production planning to understand the inventory levels we require and only order in accordance with the defined plan
- ☐ We understand our required levels of 'work in progress (WIP)' and are proactive in keeping this to a minimum without interrupting production
- ☐ We keep the necessary packaging at our facility for the upcoming production runs and work to keep this at manageable levels
- ☐ Raw material and packaging requirements for the shift are delivered prior to the commencement of shifts, typically more than 24 hours before the start of a shift
- ☐ We seldom / never need to stop production mid-way through a shift due to unavailability of stock
- ☐ We actively work towards 'just in time' production, with minimal delay between end of production and point of sale

MOTION

- ☐ We understand the importance of ergonomics (design for efficiency and comfort in the working environment) and how this directly translates to improved productivity / efficiency
- ☐ Carrying of product on the floor from one location to another is kept to a minimum
- ☐ Long distance travel and hauling is done by machines (e.g. trucks / forklifts etc)
- ☐ Workers do not have to move long distances between stations (situated close together and in the order of production flow)
- ☐ Inventory and tools are well laid out so that workers do not have to search for them
- ☐ Workers do not lift excessively heavy items (this can lead to delays and costly health issues)
- ☐ Workers stand or sit at the same level as their task (bending down or reaching up are both time inefficient and can lead to injury)
- ☐ Twisting, stretching, bending and lifting are kept to a minimum
- ☐ Tasks are appropriately assigned to men / women, understanding the legal/appropriate lifting limit
- ☐ Regular breaks are provided to ensure the pace of work can remain consistent
- ☐ We understand that the rate of motion (work speed) is often dependent on skill level and we provide the necessary training to achieve this
- ☐ External factors such as exposure to the elements are well understood and the impact that these will have on productivity
- ☐ Workers are engaged to understand if there is a better way of undertaking repetitive tasks

OVER-PROCESSING

(adding more value to the product than required by the customer) and Overproduction

- ☐ Product specifications are built in conjunction with the customer
- ☐ Product specifications are often reviewed to assess whether all elements are needed to meet customers' requirements
- ☐ Product specifications are practically orientated, giving the workers steps on 'how' to achieve the specification
- ☐ An open relationship is established with customers on potentially non-conforming/ problem products, with the processing unit not trying to hide defects
- ☐ Workers know exactly what is required of them in their role and have been well trained to perform it
- ☐ Workers have a clear understanding of quality expectations. They are aware of both the lowest acceptable quality specifications and also the maximum expectations, so they not only avoid producing non-confirming products but also don't waste time making products that exceed the specifications.
- ☐ We have a clear understanding of quantities required by our customers and where possible we only produce what we will be delivering to them

WAITING

- ☐ We seldom have a stop in production due to a machine breakdown
- ☐ We measure the cost of downtime due to machinery breakages and regularly check how these costs compare to the cost of a new machine
- ☐ Tools and equipment (for e.g. PPE) are readily available to minimise waiting time
- ☐ Production breaks are staggered to ensure minimal waiting time (for e.g. packers start 30min later to allow for freezing time of product at the start of the shift)
- ☐ Product waiting on the floor is actively managed to reduce negative effects of delays (e.g. temperature abuse etc)
- ☐ Production plans are made visible and are easy to understand to avoid delays at start time
- ☐ There are clear, open communication channels between workers and managers (waiting for information can be costly in terms of time and also can cause bigger issues, like machine malfunctions)
- ☐ Managers are 'visible' and quick to respond to workers' questions and information
- ☐ We have early detection of delays or waiting time (for e.g. red light flashing when production line stops)
- ☐ The escalation process to notify management of a stop in production / process is well understood to avoid waiting time for the problem to be reported to the right person
- ☐ If there are potential future delays that can be known ahead of time, appropriate steps are taken to limit downtime (for e.g. scheduled national/regional shutdown in electricity is known and therefore production is not planned for that day/time)

DEFECTS

- ☐ Measurements are in place to report on the number of defects per production unit (for e.g. 1 defect per 1000 units produced)
- ☐ We actively work to reduce the number of defects, with clear targets being set
- ☐ Workers are measured individually on the number of defects they produce, with incentives provided to reduce the number of defects
- ☐ We understand the difference between a defect and an allowable loss on the production line
- ☐ We measure how many defects are produced per machine and know which machines are more problematic than others
- ☐ We carry out Root Cause Analysis (RCA) to understand the reason for the defects and how these reasons can be eliminated

1.2 REVIEW: PROCESS FLOW DIAGRAM

A process flow diagram is a helpful tool to map and visualise the production flow (from order through to delivery), to identify where improvements can be made and to continuously review and analyse productivity and efficiency. You can draw a process flow diagram for the entire production cycle, as well as for each stage of the process.

The exercise of developing an accurate and useful process flow diagram should not happen in isolation, in a manager's office. You will need contributions from the workforce on the factory floor to understand the process they are daily involved with, where there are potential issues and what their recommendations are for improvements.

Value added time (V/A time) is an important concept in optimising processes. This is the actual time that value is being added to the product. Studies show that value is only added ±5% of the time in any production process[12]. Efficiency can be improved by reducing the unnecessary non-value added time. Note however, that some non-value adding time may still be necessary time. For example, the time taken for a worker to deliver raw material to the line. This step does not add value, but without it the product would not be able to be processed and packed for delivery. Also some non-value adding time may be essential to worker wellbeing (eg breaks) and therefore essential to workers' sustained productivity.

HOW TO DRAW A PROCESS FLOW DIAGRAM

1. Decide on the start and end points of the process

- This exercise can be carried out on a macro process (supply chain from start to end) or a micro process (one step within the bigger process). Often it is used to analyse the flow for just one product line, from the first step in production to the finished product being dispatched
- Decide what you are analysing upfront and continue with this all the way through the process
- It is better to undertake the process several times on different steps or products rather than try to include too much in one diagram

2. Draw out the high level plan, showing the processes and movement only

3. Gather information on:

- Value added and non-value added time per unit and/or batch, for different stages/steps
- The time it takes for a product to move from one stage to the next
- Average number of defects per batch / shift / day, for different stages/steps

4. Add the information gathered in step 3 to the process flow diagram

- Add tables to capture time and defects
- Add time between stages under the movement arrow

5. Review and analyse the process

- Having identified some key areas for improvement in the checklists on the previous pages, can you mark where in the process these issues are occurring, on your process flow diagram?
- Add symbols where there are concerns in the process, in terms of Capability/Resources (C) (you may want to break that down further into the 5Ms), Delays (D) (bottlenecks) and Waste (W) (you can break this down further into the 7 wastes if you wish)
- Write a document to capture the detail of each issue you have identified, including what is happening, where it is happening, when it is most often happening, what is the result of the issue and what the causes could be

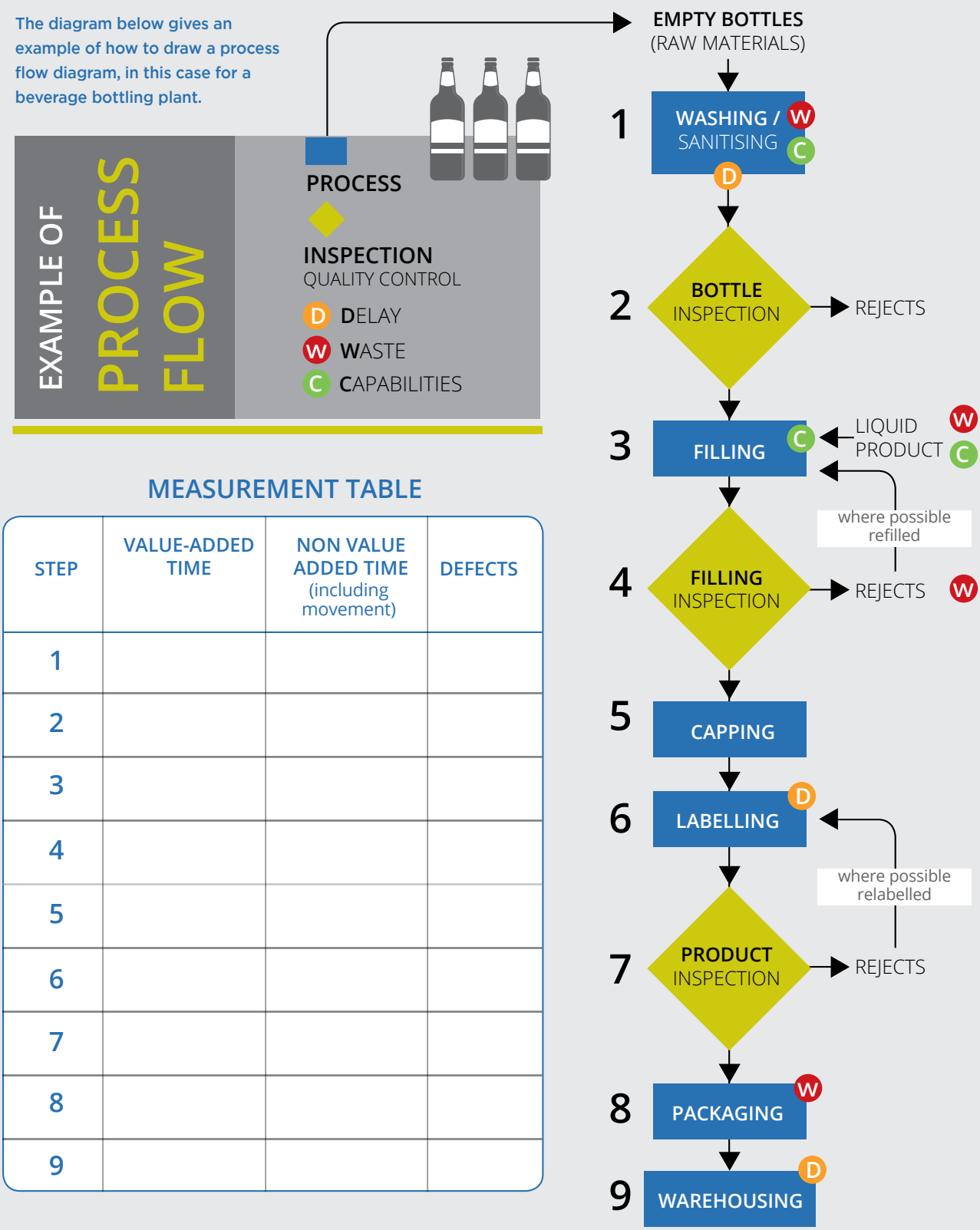
6. Allow the process to be checked by the whole team, including workers, to see if any steps or potential issues are missing.

Review as many times as possible to ensure that the process flow is representative of actual conditions.

To take this a step further you can also use your process flow diagram to measure and mark the process capacity per station, to understand and reduce your bottlenecks.

EXAMPLE OF A PROCESS FLOW DIAGRAM

The diagram below gives an example of how to draw a process flow diagram, in this case for a beverage bottling plant.



MEASUREMENT TABLE

STEP	VALUE-ADDED TIME	NON VALUE ADDED TIME (including movement)	DEFECTS
1			
2			
3			
4			
5			
6			
7			
8			
9			

1.3 REVIEW: MEASURE

So now you have a list of issues you want to tackle and you know where they are occurring in the process. Another key aspect of reviewing and understanding the current situation is having detailed, up to date and accurate measures in place. This is important for identifying issues, bringing the full extent of the situation to light and also for motivating for and measuring improvements. They lead businesses to ask critical questions about productivity and efficiency which would otherwise be 'hidden'.

THIS SECTION SHOWS HOW YOU CAN IMPROVE THE MEASUREMENT OF PRODUCTIVITY AND EFFICIENCY, STEP BY STEP.

STEP 1: DRIVERS

Ask yourselves, as a team, 'what are the drivers of our business' profitability?'

For example:

- Efficient usage of labour
- Maintaining low overheads
- Minimising waste
- Achieving throughput targets
- Efficient usage of raw material
- Low conversion cost of raw material to final product
- Purchasing of equipment that is fit for purpose and ensuring that this equipment runs at full capacity
- Maintaining low levels of working capital which includes work in progress

STEP 2: METRICS

- Agree a measure for each driver and appropriate metrics.
- What do you want to measure (eg amount of waste, throughput, efficiency of raw material use), what metric is appropriate (eg kg, seconds, percentage) and how will you collect that data? Who has the information?
- Are you already measuring this and how frequently?
- At this stage we are simply measuring what IS happening, rather than setting targets.
- (Financial reports are not sufficient – long intervals and only available after the fact)

STEP 3: SIMPLE DAILY MEASURES

- If you haven't already, put a daily measure in place
- Start simple *(eg a daily measure of throughput on each shift for the processing unit)*

STEP 4: DETAILED DAILY MEASURES

If the simple measures are working, you can go deeper and more detailed with the daily measures. For example:

- Planned throughput to actual throughput
- Number of staff and hours for throughput achieved (person hours/kg produced)
- Raw material usage for output achieved (% conversion of raw material)
- Lost time due to breakdowns (% of available time lost due to breakdowns)

STEP 5: HOURLY MEASURES

- If the 8 hour shift must produce 16,000kg, then 2,000kg must be produced each hour. If this hasn't happened in the first hour it can be addressed immediately rather than letting the issue run all day.
- Hourly measures (actual and target) can also be communicated to workers to increasing motivation.

For example:

  - Actual hourly output for each section
  - Hourly output needed to achieve shift output target

STEP 6: MINUTE MEASURES

- Minute measures can be recorded for individual workers, teams and machines.
- What does each person need to produce each minute to achieve the hourly group target? (eg if there are 60 workers, each worker needs to process 0.56kg per minute to give the hourly throughput of 2,000kg)
- In all of this, when setting targets, they need to be reasonable and safe for workers, not causing quality or health and safety issues.
- At what speed must a machine operate at to achieve the throughput?

STEP 7: ASK QUESTIONS

- Is the target throughput correct?
- Could it be more if we changed something?
- Is anything consistently limiting the throughput?
- How can we optimise our process to do more with less?
- What are the patterns of when:
  - Waste is higher than normal
  - Equipment doesn't run at full capacity
  - Work in progress is high
  - Throughput targets aren't met

STEP 8: CONTINUOUS IMPROVEMENT

- Identify areas for improvement
- Analyse WHY issues are occurring (5 Whys and Fishbone Page 20-21)
- Use the action plan tables and PDCA cycle to manage continuous improvement (see Page 22)

After using the checklists, process flow diagram and improving your measurement/metrics, you should have a clear understanding of the existing issues, their extent and where they are occurring.

But where should you start? And why are these things happening?

1.4 ANALYSE: PRIORITIES

In making changes, we need to focus on tackling the most wasteful practices first, which are going to yield greatest efficiency gains for the least effort. In order to analyse and decide where to start, you can use the Pareto principle (or 80/20 rule), which states that 80% of the effects come from 20% of the causes. In a production facility 80% of efficiency / productivity loss, is often a result of only 20% of wasteful practises. If the business focuses on and resolves 'the 20%' of most wasteful practices, it will provide 80% of the efficiency gains which have been identified.

PRACTICALLY, THIS IS THE PROCESS OF IDENTIFYING WHICH ISSUES TO ADDRESS FIRST:

STEP **1**: IDENTIFY POTENTIAL ISSUES

- Complete the checklists in Section 1.1 to identify areas for improvement
- Analyse your process (using a process flow diagram described in Section 1.2), marking where there are issues
- Make a table listing all the issues identified

STEP **2**: CATEGORISE ISSUES

- List the category of the issue next to each. Capabilities/Resources (5Ms: Methods, Manpower, Materials, Machines, Measure), Delays/bottlenecks or Wastes (The 7 Wastes: Transportation, Inventory, Motion, Waiting, Over-Processing, Overproduction, Defects)

STEP **3**: ASSESS VALUE AND RELATIVE IMPORTANCE

- Apply an appropriate estimated financial value to the resolution of each issue identified and the benefit that it would bring to the business
- The allocation of financial benefit to each of the areas identified is a challenging exercise, but it proves to be very valuable as it often leads to a motivation for a change in process or purchase of new equipment etc. If the cost of a broken machine is $1000 / day in downtime, and it costs $15000 to buy a new machine – it implies it will take 15 productive days to pay this new machine off. (For more details about calculating the cost of downtime see the tools and tips section page 31)
- The table below shows nominal values associated with each of the identified wastes (these can be per shift, month or annualised as long as it is a consistent metric for all rows)
- Calculate a total of the potential gains of resolving all the issues listed
- Add a column for percentage of the total gains that the issue/row represents (see the first table below for an example)
- [If you are unable to quantify financial benefit to the list of identified wastes, a ranking of 0-100 can be used. 0 being little or no benefit from eliminating the waste, to 100 being extremely beneficial to the business if the waste was removed. This can be used instead of value in Step 4 to prioritise.]

STEP **4**: PRIORITISE USING THE 80/20 RULE

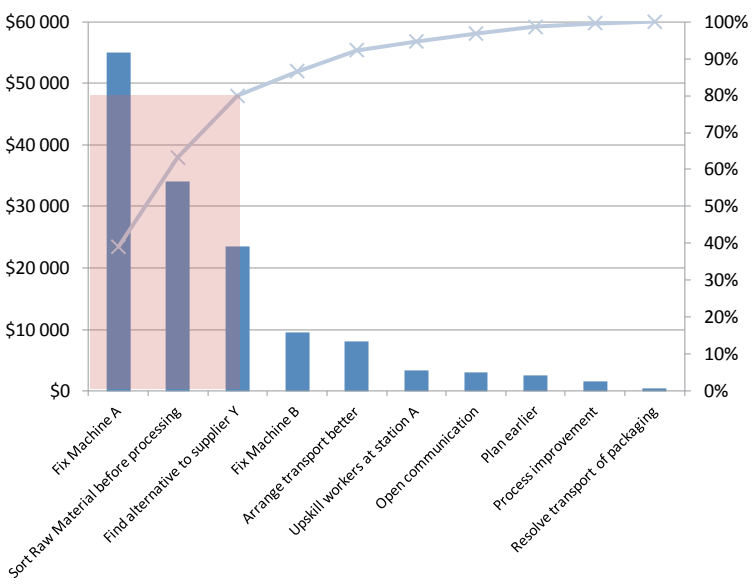
- Sort/reorder the rows in the table by the % of value (or the rank, if you have not got values), so that the highest % value (or highest rank) is at the top of the table (shown in the second table below)
- Add a new column for cumulative percentages, adding each % to the next row (see the second table below for example). This illustrates that by solving Item 5, 2 and 3 from the list – 80% of the total gains will be achieved
- The Pareto exercise therefore implies that your resources should be spent firstly trying to resolve the top three issues identified on the list. If these are addressed, they will result in 80% of the efficiency gains which have been identified from the 10 suggestions. Once those top priorities are resolved, you can keep moving down the list to the next most important issue, until all the items have been addressed

Number	Waste Identified	Category	Value if eliminated	% of total
1	Efficiency gain is available by separating the weighing and packing functions on the floor	Methods	$1,500	1%
2	Labour utilisation will be improved through better sorting of raw material	Methods/ Manpower	$34,000	24%
3	Raw Material from Supplier Y often needs to be rejected due to quality concerns, causing delays	Materials	$23,500	17%
4	The transport of packaging M is unreliable and has interrupted production on numerous occasions	Materials/ Transport	$500	0%
5	Machine A breaks down continuously, costing us 10% lost time on Line A	Machines	$55,000	39%
6	Machine B is old and clumsy, costing us raw material loss higher than the average	Machines	$9,500	7%
7	Productivity losses at station A are a result of unskilled workers	Manpower	$3,300	2%
8	Late transport of workers on a Monday means that the shift consistently starts up 30minutes late	Transport	$8,000	6%
9	The production plan is often issued late, resulting in a delay in production	Measure/ Methods	$2,500	2%
10	A stop on the production floor is not reported promptly which means further delays	Measure	$3,000	2%
	Total Potential Savings		**$140,800**	**100%**

Pareto process. Table representing Steps 1, 2 and 3

Number	Waste Identified	Category	Value if eliminated	% of total	Cumulative % of total
5	Machine A breaks down continuously, costing us 10% lost time on Line A	Machines	$55,000	39%	39%
2	Labour utilisation will be improved through better sorting of raw material	Methods/ Manpower	$34,000	24%	63%
3	Raw Material from Supplier Y often needs to be rejected due to quality concerns, causing delays	Materials	$23,500	17%	80%
6	Machine B is old and clumsy, costing us raw material loss higher than the average	Machines	$9,500	7%	87%
8	Late transport of workers on a Monday means that the shift consistently starts up 30minutes late	Transport	$8,000	6%	92%
7	Productivity losses at station A are a result of unskilled workers	Manpower	$3,300	2%	95%
10	A stop on the production floor is not reported promptly which means further delays	Measure	$3,000	2%	97%
9	The production plan is often issued late, resulting in a delay in production	Measure/ Methods	$2,500	2%	99%
1	Efficiency gain is available by separating the weighing and packing functions on the floor	Methods	$1,500	1%	100%
4	The transport of packaging M is unreliable and has interrupted production on numerous occasions	Materials/ Transport	$500	0%	100%
	Total Potential Savings		**$140,800**	**100%**	

Pareto process. Table representing Step 4



The example is shown graphically here, with the initiatives on the x-axis and the gains on the y-axis. The cumulative gains are shown in the line graph, referenced on the secondary y-axis. The shaded block shows where 80% of the gains are.

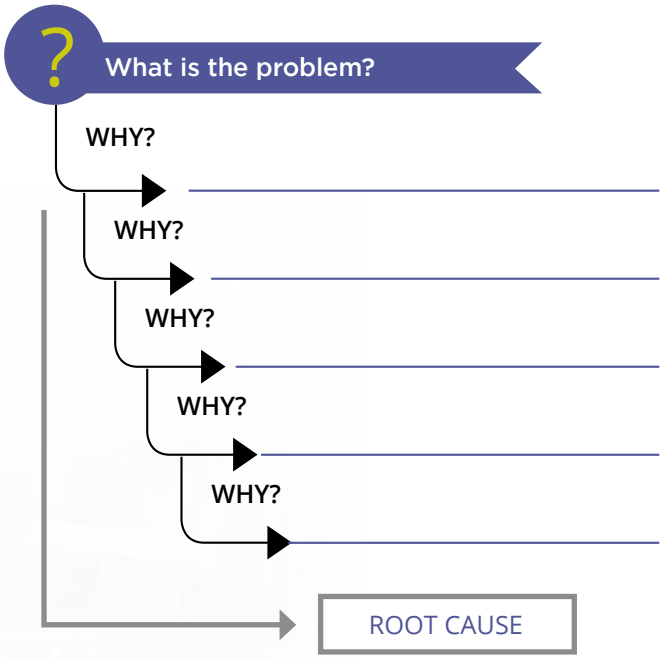
Now you know what the top priority issues are that you want to tackle, but why are they happening?

1.5 ANALYSE: ROOT CAUSES

The next step is to understand the 'root causes' of those issues identified, to diagnose the problem, which is essential before you can find a solution. Two useful tools for root cause analysis are introduced here: the '5 Whys' and the 'Fishbone diagram'.

1.5.1 ROOT CAUSE ANALYSIS: THE 5 WHY'S

In using the **5 Why's** tool to identify root causes, simply ask the question *why,* until you cannot ask it any more, or until you have got to the bottom of the real reason behind the issue. It may take you more or less than '5 Why's' to get to the real answer.



FOR EXAMPLE:

PROBLEM: Increase in downtime hours over the last month

WHY? One of the labelling machines has been malfunctioning

WHY? It hasn't been serviced in over 2 years

WHY? There is no maintenance schedule in place

WHY? The manager responsible for scheduling maintenance on the machine is new, and was not given a maintenance plan by his predecessor

ROOT CAUSE:

The company does not keep centralised maintenance plan records that multiple managers can access, or which can be easily taken over by a new manager.

THE SOLUTION:

Create a central database of all machinery maintenance schedules that can be accessed by multiple managers. Ideally, this system should also send reminders to managers in advance of the next maintenance event.

1.5.2 ROOT CAUSE ANALYSIS: **FISHBONE DIAGRAM**

The concept is to create a diagram that is in the shape of a fishbone, to assist in solving more complex problems that could have multiple causes.

When to use a fishbone diagram

- To explore all the possible causes that result in a single problem (eg. bottlenecks at step 3 on line A)
- To find out why a process is not working properly

Fishbone diagram

HOW TO USE IT

Write down the main problem you are facing at the "head" of the fish

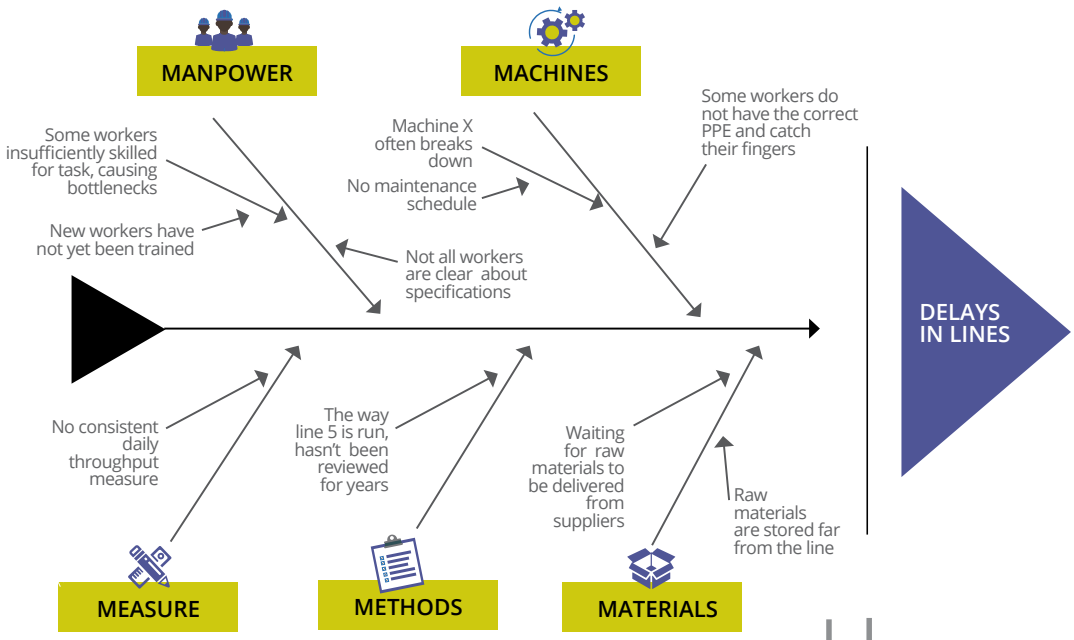
Use the **5Ms** (methods, manpower, machines, materials, measure) as the "big bones" of the fish. These are the categories that will be analysed

For each category, write down any causes that you think could be contributing to the main problem. For example 'insufficiently skilled workers, causing bottlenecks' could be a cause under "manpower"

Use "small bones" to add more information to a cause. For example 'new workers have not yet been trained' could be a reason why the insufficiently trained workers are causing bottlenecks

ONCE YOU HAVE BUILT YOUR FISHBONE DIAGRAM:

- Analyse the diagram and rank the causes by priority of how significant they are in contributing to the problem: High, medium, low priority
- Discuss as a team to find solutions and implement changes, starting with high priority causes
- Assign responsibility for each improvement action you agree on and check it is completed (more ideas are given on how to manage this improvement process in the next section)



CAUSES

EFFECTS

Now you know your key priority issues, their extent, where they are happening and why they are happening. So what are you going to do about it?

1.6 IMPROVE: MANAGING CONTINUOUS IMPROVEMENT

Action plan tables

At the back of this toolkit there are action plan tables. You can use those to keep track of the actions you decide should be taken to tackle the issues you have identified. It helps to have all the actions listed in one place, with a note of who is responsible, when it should be done by and a space to write what progress has been made.

Plan-Do-Check-Act Cycle [13]

Whatever improvement you decide to implement, you can use management expert W Edwards Deming's 'Plan-Do-Check-Act cycle' to guide the process of addressing the root causes you have identified, to improve productivity and efficiency.

1. PLAN

Understand the current situation

Collect and analyse information gathered through the checklists, process flow diagram exercise and measurements – using the 'Review' sections above

Understand the impact on the business (both qualitative (costs) and quantitative (team morale, motivation, H&S)) and also what the impact of solving the problem would be on both

Select a project/issue to tackle and understand it fully

Select a priority project or problem to solve (identify any patterns or particular issues that are being repeated or are particularly high priority – using the '1.4 Analyse: Priorities' section above)

Identify the root causes of the issue (find out why the issue is happening and what can be done to improve it – using the 1.5 Analyse: Root Causes' section above)

Work with a team

Bring together the most suitable team to tackle the problem (internal/external expertise? Complimentary skills – 'hard' and 'soft' skills may both be needed)

Look in the toolbox – This document provides a valuable toolkit of problem solving techniques and tips. Can you find some that are relevant to this issue/project? What other resources do you have available?

Has anyone in the business solved a similar problem before? What was learnt from that?

Brainstorm with your team to determine possible solutions and together choose a solution to try first

Agree a plan

Prepare a implementation plan and schedule, with specific responsibilities assigned to individuals, with timelines attached

Set a target of how you want things to improve, with appropriate metrics

2. DO

Implement solutions on a trial or small scale before making fundamental changes to the business

Check that each task in the implementation plan has been successfully completed

3. CHECK

Monitor and measure how the new solution is performing

Has it met targets? Were targets realistic? Are new targets needed?

Compare the metrics and measures to what was collected before the solution was trialled

Tracking and reporting progress is essential to keep the team motivated to continue

Get feedback from workers (and customers where possible)

Are the measures you are using accurately reflecting the problem and the improvement?

Are you only measuring quantitative gains? Can the qualitative gains also be measured and reported on?

Refine the solution – Was there any aspect that didn't work well? What can be done to address that?

How can the improvements be maintained?

4. ACT

Make any changes required to improve the implemented solution

If the solution is working, make it a permanent part of the production process

Can the solution be extended to other areas?

Once you have successfully implemented one solution you can return to the plan stage, to tackle another issue

Teamwork is essential to continuous improvement. At each step of the cycle it is important to use the experience and insight of those involved in the production process by encouraging and giving opportunities for workers to identify issues, come up with solutions and contribute to implementing those solutions.

Objectives / KPIS

Part of managing improvement is setting and tracking targets. Objectives are specific, measurable goals that you can keep track of on a regular basis, by collecting data that matches Key Performance Indicators for each objective. You may wish to set objectives and KPIs for specific departments or even individuals. You can then measure the KPIs and have monthly report backs and problem solving sessions with teams.

The Objectives and KPIs you set will be specific to your processes and priorities but some examples are given below.

Objective	Key Performance Indicator	Target	Achieved This Month
Increase efficiency of machinery use	% increase in OEE Score for each machine (explained below in Section 1.7.2, page 28-29)		
Reduce lost time due to machinery breakdown	% decrease in lost time (per month, per key piece of machinery)		
Increase efficiency in raw material use	% increase in raw material conversion/yield (less raw material usage in relation to output achieved)		
Improve frequency and detail of productivity measures	Number of lines with daily productivity measures		
Maximise manpower productivity	Number of departments with daily production meetings		
	Number of departments/lines using visual management techniques		
Use line balancing to decrease waste of delays/bottlenecks	Number of lines that have been analysed with process flow and changes made to balance lines		
	% increase in productivity in balanced lines		
Promote worker feedback	Number of worker- reported productivity/efficiency issues		
	Number of worker-reported productivity/efficiency issues resolved		
	Number of worker generated ideas for improving productivity/efficiency		
	Number of worker generated ideas for improving productivity/efficiency implemented		
Improve on-time delivery	% decrease in late deliveries (per month, per customer, per product)		

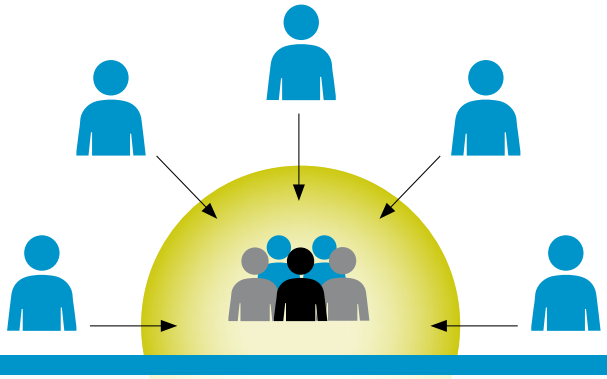
1.7 IMPROVE: TOOLS AND TIPS

You can pick and choose from the tools and tips below based on what you think is necessary for the particular priority issues you have identified and their root causes. You can refer back to the flow diagram of the chapter on page 10 to give you an overview. This section gives tools and tips on Manpower/people, Machinery, Delays/ bottlenecks and Waste.

1.7.1 IMPROVE: MANPOWER

Communication and team work

Productivity can be improved by better communication of production targets and sharing ownership of meeting those targets with supervisors and workers. This can be done in a number of ways:



COMMUNICATION & TEAMWORK

DAILY **PRODUCTION MEETINGS**

Daily production meetings to discuss the day before, any issues and explain the targets for the day. This can just be a very brief 'stand up meeting' on the production floor at the start of the shift. (More details on this and a possible agenda are given in the Worker Cooperation and Communication chapter, page 69). See the case study below.

COMMUNICATE THE **WHY**

It is important that the **'why'** is communicated to the workers. Why it is important to work at a more efficient rate, why productivity improvements are essential for longevity of the business (and therefore provision for their families) and the important role that the workers play to enable this to happen.

VISUAL MANAGEMENT **TECHNIQUES**

Using **visual management techniques** such as display boards with production targets and output data means workers can track their progress against targets on an hourly/half daily basis. Visual aids also assist with lines / sections being able to track **progress in relation to one another.** Intuitively, if a line sees they are falling behind the other they will increase productivity to catch up and this can create healthy competition on the floor.

The chapter on Time Management and Productivity (page 62-63) explains these methods in more detail, including case studies of where they have been used successfully.

CASE STUDY
PRODUCTION MEETINGS IN SOUTH AFRICA

Two production sites in South Africa have seen the benefit of regular meetings.

One site had weekly production meetings only with senior management but now includes team leaders/ production supervisors. They have found they are able to identify issues and find practical solutions quicker.

Another site started to have morning meetings for each team including the team leader/supervisor and all workers, a production meeting for managers at the end of each day, one for team leaders and managers weekly and a bigger monthly meeting. Any concerns with quality or production were raised and suggestions for improvements were given. If a certain quality mistake was being repeated and having to be returned to be re-worked, the whole team would brainstorm solutions and agree what changes they would make. Sometimes very simple changes made a significant and immediate impact on productivity and quality.

"We have these monthly meetings where we can earn a free bottle of cool drink for those who come up with the best ideas for changes on the site. So someone will make a suggestion for a practical change and we will see the changes then happen. I think it is encouraging us to speak up more." – Worker, South Africa.

"Before we were not working together, everyone was going their own way. But now everyone supports each other because we know we can work together for the benefit of the company and that is also for our benefit so we can take money home for our families." – Stock controller, South Africa.

Skills and remuneration

The Wages chapter (page 80) and Workforce Management chapter (page 78) illustrate in more detail how productivity is improved by building the capacity and motivation of a workforce through skills development and decent wages. Studies show that skilled workers are **23% more productive** than their unskilled counterparts,[14] and that higher wages motivate **harder work by up to 12%** [15].

PIECE RATE SYSTEM

Some companies find that using a **piece rate system** for wages, can help to motivate higher productivity. However it doesn't work for every company, product type or team. If considering a piece rate system, you need to be careful you are not just driving productivity but forfeiting quality. Quality controls and checks may need to be strengthened if a piece rate system is initiated. *It is also absolutely essential that the system is structured in such a way that EVERY worker receives at least minimum wage for EVERY pay period. If there is no legal minimum wage where you are, see the note at the end of the section.*

THE BENEFITS

- Productive workers earn more, which is a good motivator towards productivity
- Wages are linked to the level of production, meaning employers don't cover the cost of poor worker productivity
- Employees hitting production targets are rewarded for their efforts, which improves morale and reduces staff turnover of good workers

WHEN THE SYSTEM WORKS WELL

A piece rate system doesn't work for every business. Where the following are in place it may be worth trying this system:

- Pieces or units of work are measurable
- There is a clear relationship between worker effort and output
- The job is standardised: the workers are producing the same thing every time, all the time
- There is a regular flow of work, and workers are not dependant on other factors to determine their output and therefore wage
- Machine breakdown is at a minimum. (Employers should cover the wages of workers during machine downtime)
- The quality of output can be maintained even when production increases
- The piece rate can be determined very accurately

If this does not sound like your business, then a straight piece rate system is not for you. You may want to rather consider paying productivity bonuses and/or incentivising teams rather than individuals

THE DISADVANTAGES

- It can be difficult to set the right piece rate
- Quality of output can be negatively affected by workers prioritising speed – this needs to be carefully managed. As the system matures in the organisation, a quality 'score' can be included in the calculation of the piece rate system.
- It doesn't allow for rewarding employees for seniority/ experience, which is important in some locations due to cultural beliefs
- Introducing new technology or production methods impacts on the piece rate, and has to be taken into consideration
- It can lead to employees over-working, causing health issues, which are a cost to the business
- It can create a competitiveness between workers that leads to bigger cultural issues or reduced effectiveness in team work

HOW TO CALCULATE STEP BY STEP

- STEP **1**. **Test current productivity** – Establish the current average rate of production per person. Measure how many pieces are produced in a current working hour, and divide that by the number of workers. Individual time study is also advised at this step to understand how employees perform in relation to one another, and how an unskilled person performs compared to a skilled person.
- STEP **2**. **Work out a fair production rate** - Workers have to earn the minimum wage, at the very least, so when calculating the piece rate you must ensure that slower workers are able to still earn the minimum wage. To make this achievable, divide the average number of pieces per person, per hour, by 1.2, to give a figure slightly below average.
- STEP **3**. **Calculate the piece rate** - Using the normal hourly pay rate (at least minimum wage or more), divide this by the number of pieces per person determined in step 2.
  The full formula is as follows:
  Minimum wage per hour /
  (Ave rate of pieces per hour / 1.2) [16]
- STEP **4**. **Determine the wage** – Therefore, the wage per worker is: number of pieces produced x rate per piece. There will need to be trial periods and feedback, to ensure every person is making at least minimum wage without undue stress or pressure that could lead to accidents.

Example:

- 50 – Number of workers
- 450 – Average number of pieces completed per hour
- 9 – Average number of pieces completed per person, per hour
- $10 – The minimum wage for an hour
  ($10 / (9 / 1.2)) = $10/7.5 = $1.33
  Therefore, the piece rate is $1.33 per item made

APPLICATION

- **Run a trial** – Use the piece rate for a test run, check everyone is able to consistently make at least minimum wage. If not, make up everyone's wage to at least minimum wage and adjust the piece rate. This may need to be done quite a few times to get a correct piece rate
- **Make up to minimum wage:** Even once a piece rate is set, any worker making less than minimum wage based on piece rate must have their wage made up to at least minimum wage
- **Communicate** – Very clearly communicate the new payment system, and how it works. Encourage questions. It is essential that it is not only fair but is also perceived and understood to be fair
- **Get feedback and monitor** – Get weekly feedback from workers. Keep a record of productivity and wages paid
- **Re-assess** – Based on feedback and data, decide how the system can be improved, and whether it is meeting your goals

NOTE: If there is no legal minimum wage in the country where you operate you need to benchmark the piece rate wages against the prevailing wages in the factory to set a minimum piece rate wage. This may be determined by a collective bargaining council. If there is no legal minimum wage, you may wish to carry out a 'living wage study' for your site, described on page 81-82.

RESOURCES AND TOOLS

- Further information on piece rate systems: http://www.ilo.org/global/topics/wages/minimum-wages/definition/WCMS_439067/lang--en/index.htm
- Insights and practical examples of the impact and challenges of piece rate pay [17]: https://nature.berkeley.edu/ucce50/ag-labor/7labor/10.pdf

BONUSES AND INCENTIVES

Other businesses incentivise worker performance through productivity bonuses. Typically, this means a lower base salary (that still meets minimum wage) with rewards for meeting certain performance targets.

Some important things to consider if adopting an incentives scheme:

Ensure you are consistently paying at least legal minimum wages. Performance pay, incentives or bonus schemes should not be considered to calculate base salary

Pushing too hard can be counter-productive: The schemes shouldn't be used to continually push up the expectations of productivity or output as this can make workers dissatisfied, de-motivated and frustrated, which can decrease overall productivity

Involve workers: If workers are actively involved in designing the scheme it is more likely to be successful because it increases confidence that it'll be used fairly

Teams: Where teamwork is important in a particular process, individual targets may create competition which may damage team dynamics and effectiveness. In some situations it may be possible to have team targets and team rewards

Keep an eye on it: It's important to monitor and ensure that production targets and rewards don't lead to overworking or cutting corners with safety or quality in order to hit targets. It is also important to understand the causes of lost time which are outside of the workers control, which may impact their ability to meet targets

Non-financial incentives and recognition can also be established for individuals or the best performing line / section. A small amount of recognition such as being 'line of the week' can go a long way to improving productivity

Gainsharing

Gainsharing is another option, which means that workers are involved in identifying and implementing improvements in productivity and a proportion of the financial gains from increased performance (above a measured baseline) are shared with workers. Key elements to consider, to ensure it is successful, include:

- actual and perceived fairness
- regular information sharing with employees
- worker engagement in the development and monitoring of the scheme
- clear communication in advance, of the targets and of the benefits that will be shared if targets are met
- rewards distributed fairly with no preference or discrimination

CASE STUDY
BONUSES AND INCENTIVES

Nucor Steel is one company that has successfully implemented Pay-For-Performance and productivity bonuses [18].

How it works at Nucor Steel:

Workers earn a lower base salary (that is at least minimum wage), but are given a percentage of the revenue from the plant. This helps promote a 'working together' culture.

Employees are also rewarded based on their individual performance as follows:

- Exceptional performance bonuses for exceeding hourly quotas
- 5% bonus for each target level achieved
- Bonuses paid at end of every week, increasing motivation
- Lose bonus for the day if late for work (but at least minimum wage is guaranteed)
- Employees have a way to appeal if they feel they have been treated unfairly

Results:

- Nucor has a very low absenteeism rate of between 1% – 1.5%
- Productivity is ±3 times the industry average

1.7.2 IMPROVE: MACHINERY

If the 'review' and 'analyse' sections showed up issues with machinery, you could use this tool to help you to solve the root causes you have identified.

Overall Equipment Effectiveness (OEE)

WHAT IS IT?

- OEE is an asset utilisation tool used to measure the overall effectiveness of key machinery within the business
- Specifically focused for continuous processing plants
- A clear and unambiguous measure

WHY IS IT USEFUL?

- It incorporates machine availability (usage), the performance on the line (rate of work) as well as quality defects from the line into one score showing the overall effectiveness of the machine

HOW DOES IT WORK?

OEE is measured in a percentage and is the product of:

- **Availability (%)** – What percentage of the available running time was the machine / line actually running?
  - eg. The line was scheduled to run for 100min, but experienced a 10min breakdown in machinery
  - (100min – 10min)/100min = 90%
- **Performance (%)** - What was the performance of the machine in the running time, compared to manufacturer's design capacity?
  - eg. The line was running for 90min and the manufacturer specified 10 units to be produced per minute, but the floor only produced 800 units
  - (800 / 90min x 10) = 89%
- **Quality (%)** – Number of non-defective units as a percentage of total units produced.
  - eg. 800 units were produced and 20 of these were defects
  - (800-20)/800 = 98%.
- **Overall score** – Produced by multiplying the 3 scores together
  - (90/100) x (89/100) x (98/100) = 0.78 = 78%

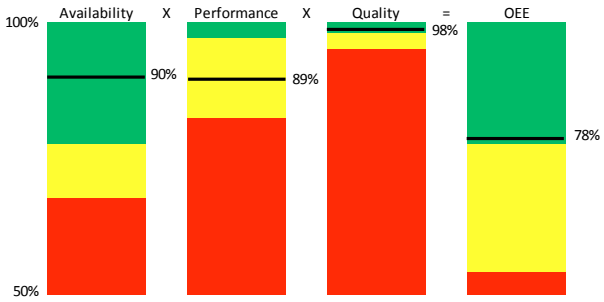
Showing the OEE Score graphically

One way to do this is through a red/amber/green system on bar charts, where green illustrates high equipment effectiveness, amber shows average and red is poor.

The percentages that represent good/average/poor are different for the 3 elements. So the percentage/position at which that bar has the amber band would be different for each. For example 90% is good for availability but the same percentage score would only be average for performance and poor for quality.

The exact percentage of what constitutes green, amber or red would be business specific and also dependent on the current equipment effectiveness of the plant. The management team could set internal stretch targets for each production line or individual machine based on how the plant is operating currently.

The figure below shows how one can represent the OEE score for a specific machine on a particular shift. The bars just show 50-100%. As explained above the coloured bands are at different positions because what constitutes 'good' is different for the different components. It shows how the equipment scored with respect to Availability (90%), Performance (89%) and Quality (98%). These three multiplied together gives an OEE score (78%).



The red/amber/green system also allows the business to compare the OEE of one machine against another, different production lines in relation to each other, understand where there is opportunity for improvement and see the trend in OEE over time.

To take this tool a step further you can analyse each of the three components to find out where the majority of losses originated from, which will help in identifying issues that need to be resolved (eg start up product losses, major breakdowns/ stoppages, set ups, change overs).

1.7.3 IMPROVE: **DELAYS/ BOTTLENECKS**

If the 'review' and 'analyse' sections showed up delays and bottlenecks, you could use these tools and tips to help you to solve the root causes you have identified.

Line balancing

WHAT IS IT?

- Line balancing means levelling the workload across all processes in a cell or value stream to remove bottlenecks and excess capacity
- This results in a reduction in waiting time/non-value adding time, which is in most cases a significant and costly waste

HOW DO YOU DO IT?

- Identify bottlenecks: Use your process flow diagram and get feedback from workers and supervisors (eg in daily production meetings)
- Then you know where you need to improve critical path analysis and production layout
- This may mean changing the number of workers doing a particular process or stage in production
- Or even physically rearranging workstations and production flow
- In some industries shifting to straight line production can significantly increase productivity
- Any changes must be well explained to workers

RESOURCES TO HELP

- There is a 'Six Sigma' online 'calculator' that assists you to work out the time and loading for each process in the production line and therefore how to 'balance' the line so there are no bottlenecks

  http://www.six-sigma-material.com/Line-Balancing.html [19]

CASE STUDY STRAIGHT LINE PRODUCTION

Physically rearranging production flow can have a dramatic impact, but may be more appropriate for some product types than others.

For example one factory in the Impactt Overtime Study[20] (aiming to reduce overtime through productivity and HR improvements) introduced straight line production in the pre-production department, which allowed semi-finished parts to be passed on to production as they were ready, rather than waiting until a whole batch was complete. This almost halved pre-production lead times.

Straight line production improved efficiency by 86% in another Chinese factory.

Tackling downtime

A key issue causing costs to business through bottlenecks is Downtime (the stopping of production due to machine breakdown, labour strikes, injury, waiting on inventory etc.).

Statistics suggest that downtime **can reduce productive capacity by up to 20%**. A US study of downtime in the auto manufacturing industry reported **a cost of $22 000 per minute**. [21]

COSTS INCLUDE

- Loss of production
- Cost of unproductive labour while not working
- Cost of machine repairs or replacement
- Loss of inventory
- Not meeting delivery deadlines, which leads to reputational damage with customers and potential lost business in the future

CALCULATING DOWNTIME

Cost of downtime = lost revenue + lost productivity + repair costs + lost inventory

Example cost of 3.5 hours downtime in Bob's Factory:

- Lost revenue = revenue per hour x hours of downtime
  - $2 400 x 3.5 = $8 400
- Lost productivity = cost of labour per hour x number of workers affected x hours
  - $9 x 10 x 3.5 hours = $315
- Repair cost = cost to repair machine
  - $310
- Lost inventory = cost of materials damaged
  - $150
- Cost of downtime event:
  - $8400 + $315 + $310 + $150 = $9175

This does not include reputational damage of customers' opinions of the product and potential future orders being impacted by late or poor quality products delivered.

BEST WAYS TO MANAGE

- Ensure there is a regular and up to date maintenance schedule for machines
- Invest in training and skills development for employees to avoid user error
- Make sure that workers get regular breaks and do not work excessive hours (tired workers are more likely to make mistakes that can cause work stoppage through injury or machine failure)
- Invest in technology to monitor production line performance, and provide early and on-time notifications
- Ensure systems are in place to guarantee that inventory is available and accessible when it's needed

CASE STUDY COCA COLA BEVERAGES SOUTH AFRICA (CCBSA) IMPROVES WAREHOUSE EFFICIENCY

New information technology was introduced in the warehouse.

The system's primary aim was to control the movement and storage of materials within a warehouse (on site) and to process the associated transactions, including shipping, receiving, put-away and picking.

It reduced the amount of time spent loading and picking a shipment and also built in checks for the accuracy of the shipment.

This resulted in an optimised warehouse that could handle more orders, faster by having the technology for live statuses of stock levels etc.

Interview with Zarine Roode, Policies and Governance Specialist, ABI Bottling (Pty) Ltd, CCBSA.

1.7.4 IMPROVE: **WASTE**

If the 'review' and 'analyse' sections showed up issues with waste, you could use this tool to help you to solve the root causes you have identified. It is estimated that the efficiency gains of up to 30% can be achieved by eliminating many of the 7 *Wastes* of manufacturing. [22]

THE 5S MODEL

This is a workspace organisation model that can be implemented and practiced on a regular, ongoing basis to reduce waste.

SORT
REMOVE ALL CLUTTER FROM THE WORKSPACE
Makes it easier to find things and move around a workspace, reducing waste of waiting and motion

SET IN ORDER
ORGANISE ALL TOOLS, EQUIPMENT AND MATERIALS
Makes it easier to find and pick up items, creates a system for managing inventory, reduces time searching

SWEEP
CLEAN UP THE ENTIRE AREA ON A DAILY BASIS, INCLUDING MACHINES
Keeps workspace safe, helps reduce machine wear and tear, shows up breakages

STANDARDISE
SET WAYS OF WORKING (PROCESSES) FOR THE FIRST THREE STEPS
Helps maintain high standards in the workplace, and maintain consistency

SUSTAIN
MAKE SURE THAT THE 5S METHOD IS PART OF THE CULTURE OF THE BUSINESS
Workers can do it without being told, improves overall efficiency

REDUCING WASTE, INCREASING EFFICIENCY – **WATER AND ENERGY**

Becoming more energy efficient and reducing water use can be very significant cost savers for your business. The Environment chapter (page 96) gives more detailed information and tips to help you reduce costs in this area.

CASE STUDY REDUCING WASTE: FLEET FUEL EFFICIENCY

Between 2005 and 2015, Walmart improved fleet fuel efficiency by ±87% (reducing transport waste) through better delivery routing of vehicles, truck loading, driver training and new technologies, as part of an initiative to reduce their carbon footprint. This produced an estimated cost saving of almost $11 million. [23]

2. QUALITY OF PRODUCT

WHY THIS IS IMPORTANT TO YOUR BUSINESS

For products to sell, they need to be highly marketable and desirable, with quality consumers can trust. Consumers hold brands responsible for quality and so the quality of products is very important to brands, alongside other areas of supplier performance.

If there are quality issues with your products, this can result in unexpected costs. If the quality issues are discovered before the products leave your facility, there are costs of having to repair or remake defective products, including both material and labour costs and there is the loss of potential revenue. If the products with quality issues leave your facility and have to be dealt with later, there are even higher costs including potential return of the products and the cost of damaged reputation or lost customers. It is always more cost effective in the long run to make it right first time.

A quality driven ethos and an efficiency / productivity orientated mindset go hand in hand. A business only driving efficiency gains but ignoring quality will soon see any productivity gains eroded through rework and rejected product. Similarly, a business only focused on ensuring the right quality at any cost will lack the efficiency to remain competitive.

A **quality driven ethos** and an **efficiency / productivity** orientated mindset go hand in hand.

THE EXPECTATIONS

Ensure that the purchasing companies' detailed quality expectations are met in full every time.

This means that systems need to be in place to ensure both 'Quality of Product' and 'Consistency of Product'.

WHO

As with productivity, a quality assurance culture needs to be engrained throughout the organisation, from the most senior managers to the workers, including line supervisors, factory managers, quality assurance teams, HR practitioners and all supporting services.

WHAT THIS MEANS IN PRACTICE

The 5Ms framework was used in the 'Review' section of the Productivity chapter and is also a useful tool to help define what quality looks like, and what is required to improve quality in the production process.

1. **Methods** – The ability of a management team to create the right processes to ensure quality
2. **Manpower (People)** – A well-trained, motivated workforce who understand and work towards the same quality standards
3. **Machines** – The suitability and performance of the machinery, equipment and facilities used in production
4. **Materials** – The quality of raw ingredients / materials used in production
5. **Measure** – The measuring of quality, time and costs

Look out for defects resulting from:

- Below standard skill levels
- Poor work conditions
- Malfunctioning machinery and equipment
- Sub-standard raw materials
- Storage and transportation

These sections have been designed as a practical guide for any business to improve their productivity and quality. We recommend that these sections are applied in conjunction with your existing ISO certifications (if applicable).

The International Labour Organisation has developed some very useful materials on quality, productivity and related topics, called 'SCORE, Sustainable Competitive and Responsible Enterprises', which are highly recommended (more details in the endnote references, with contact details for further information [24]).

The diagram below gives you an overview of the whole Quality chapter, how the different sections fit together and how it flows as a whole process. By following the *Review, Analyse, Improve* method, teams can continuously build their capabilities to improve quality and reduce defects. .

QUALITY

SECTION OVERVIEW

REVIEW

- Find out where you are at now
- What are the areas for improvement?

1 CHECKLISTS
USE THE CHECKLISTS
Identify key areas for improvement

2 PROCESS
DRAW A PROCESS FLOW DIAGRAM
Use the diagram you drew in the productivity section to identify where issues are happening

3 MEASURE
METRICS AND DATA COLLECTION
Improve data collection to better understand the current situation

A clear understanding of existing issues, their extent and where they are occurring

ANALYSE

- Identify where to start
- What are the root causes?

4 PRIORITISE
PRIORITISE WHERE TO START
Pareto process

5 ROOT CAUSES
UNDERSTAND THE ROOT CAUSES OF THE ISSUE
• 5 Why's • Fishbone

You have a list of top priority issues to tackle and an understanding of why they occur

IMPROVE

- Use the tools provided to manage the improvement process

To improve quality you will need to address all four improvement areas

6

- 6.1 Quality objectives
- 6.2 Quality Control / Assurance
- 6.3 Problem solving to reduce defects
- 6.4 QA culture and teamwork

2.1 REVIEW: CHECKLISTS

This section explains the details of what this means in practice and can also be used as a tool to self-assess your site. Put a ☑ if you think that point is in place in your business and put a ☒ if it isn't or needs improvement. You can then create an action plan, to assign and follow up an action for every ☒ (sample action plans are given at the back of the toolkit).

METHODS

- ☐ We know exactly what the customers' quality requirements are
- ☐ Everyone on site understands the reason for the quality requirements and why these are important to achieve
- ☐ Our plan of products and processes are designed as simply as possible to meet the customers' actual needs, not what we may perceive these needs to be
- ☐ We get regular feedback from the customer to ensure quality standards are met, and about how we can improve, to meet these standards more efficiently (both now and in the future)
- ☐ The business ensures that all team members know exactly what the final product quality requirements are, as well as how the quality of each individual team's output contributes towards achieving this overall quality
- ☐ There is a written set of criteria for products that will be declared irregular instead of being repaired
- ☐ There is a culture of employing strong process discipline, through Standard Operating Procedures (SOP)'s which ensure consistency
- ☐ The team is encouraged to offer input towards the setting of the process / SOP, but they are also consistent and meticulous in the execution of the agreed plan
- ☐ Some measures of quality are included in Key Performance Indicators (KPIs) when measuring productivity and team performance
- ☐ There is one or more inspection points before final inspection of the finished products
- ☐ The quality inspections happen frequently to avoid long runs of 'out of specification' product
- ☐ Someone is responsible for sorting defects from final inspection for distribution back to the appropriate departments (the department which makes the mistakes are made aware of the rework, to maximise learning/improvement)
- ☐ The business has measures to tackle repeated quality issues and to reduce future defects
- ☐ We consistently deliver quality products/services
- ☐ We consistently deliver products/services on time

MANPOWER (PEOPLE)

- ☐ Staff are employed with the right skills and experience to do their job well
- ☐ Every staff member is trained and equipped for the job that they are doing, including an understanding of their job's effect on downstream operations
- ☐ Managers understand the cost of quality mistakes
- ☐ All employees are informed about customer expectations and quality standards /specifications and how to avoid common quality issues
- ☐ All employees have access to the operational specifications for the task they are completing
- ☐ Understanding of specifications is reinforced by examining a correctly constructed sample before production starts
- ☐ Working conditions (including health and safety) are good and allow people to do their jobs well
- ☐ Line and floor managers are trained and equipped to easily spot and address quality defects
- ☐ The person responsible for quality is able to halt work that does not meet requirements, even if there is a rush for delivery
- ☐ Quality concerns being raised by workers is welcomed by management, not seen in a negative light
- ☐ There are opportunities for workers/operators to suggest changes to improve quality
- ☐ Such suggestions are implemented where appropriate

MACHINES

- ☐ We have the right machinery, tools and equipment to produce the desired quality of product
- ☐ Our machinery does not damage the product, or result in unusually high rejects or wastage
- ☐ Contamination of product from machine damage occurs very rarely
- ☐ Raw material wastage through the use of machinery is kept to a minimum
- ☐ Problems with machines causing quality defects are identified immediately and reported to the appropriate person
- ☐ Equipment is well maintained, reliable and looked after by the business
- ☐ Operators understand the import role they play to ensure the machine is handled correctly and can deliver the required quality
- ☐ Workers responsible for the maintenance of the machines understand the importance of machinery in order to meet the required quality
- ☐ Machines are serviced regularly, according to a maintenance schedule, and repaired immediately when required
- ☐ Good lighting and supporting services are provided to meet the required quality standards
- ☐ Facilities are clean and well maintained, to meet hygiene and quality standards, throughout the year, not only around the time of an audit

MATERIALS

- ☐ Incoming materials from our suppliers are inspected for quality
- ☐ Clearly written quality specifications are available to the quality inspector of incoming goods, so they know what is acceptable and unacceptable quality
- ☐ Expiration dates of incoming materials are known and tracked during the production process (if relevant)
- ☐ Packaging quality is inspected before it is accepted to ensure it conforms to the customer's requirements
- ☐ The specifications for the quality of incoming products is agreed in purchase orders
- ☐ Quality/damage reports of incoming materials are regularly shared and discussed with our suppliers
- ☐ Raw material from suppliers which does not meet the required specification is rejected
- ☐ The raw materials we use are of consistently good quality
- ☐ Raw materials are ethically and responsibly sourced, from companies that we know and trust
- ☐ Goods are stored in appropriate clean areas, so that spoilage/damage is rare
- ☐ Goods are handled with care during the production process
- ☐ Hygiene and cleaning materials are certified and meet the customer's requirements
- ☐ PPE assists the worker to achieve the desired quality, not hindering the process

MEASURE

- ☐ The quality measures are in line with the specifications and the required standards of the customer
- ☐ We have an internal measure for every external check (i.e. if a quality measure will be checked by the customer then we have an internal check which will verify this before the product is sent)
- ☐ We have easy to measure standards of quality for each step of a process
- ☐ The business understands the definition of a 'defect' and the multiple ways that any one product can be below the required specification
- ☐ Accurate measures of quality are kept, including % defect rate and % reworking, by department and by product
- ☐ We are able to track and trend quality measures to determine if we are getting better or worse in particular areas / departments
- ☐ The quality measures are clearly defined and agreed by all in the business. Quality results are seldom disputed internally
- ☐ We don't send product and 'hope and see' if it will be rejected by the customer
- ☐ Our internal controls and measures are of a similar standard to that of the customer, not lower or excessively higher
- ☐ We take representative samples for quality checks
- ☐ Our quality checks are verified independently

2.2 REVIEW: PROCESS FLOW DIAGRAM

Use a clean version of the process flow diagram you drew up for the productivity chapter and mark on the diagram WHERE in the process there are recurring quality issues or high levels of defects. This should help you to refine your understanding of any issues identified in the checklists. You can categorise the issue points you've identified according to the 5Ms. (Methods, Manpower/people, Machines, Materials, Measure).

2.3 REVIEW: MEASURE

DEFINING DEFECTS AND CALCULATING A METRIC

It is essential to clearly define what constitutes a defect. A defect can be broadly defined as a product / system / process that is not at the desired specification. Both management and production workers need to be very clear on what the specifications are and what constitutes a 'defect' for each product. Six Sigma[a] provides a clear way of measuring and calculating 'Defects Per Unit' (DPU) or the rate of defect production.

$$Defects\ Per\ Unit\ (DPU) = \frac{Defects\ Observed}{Number\ of\ Units\ Inspected}$$

The challenge, however with DPU is that the number of defective units observed on a car with thousands of parts, versus a skateboard with only a few parts would show significantly different results and make the measure hard to compare across a product range or between factories. If this is a concern for your production site where you are trying to compare products of differing complexity you may want to research using 'Defects Per Opportunity' as another measure.

DATA COLLECTION

In order to set and track progress against objectives, you first need to be collecting accurate and consistent data on quality.

Some of the data you need to be collecting includes:

- Number of rejects for each product and each department, each month
- Number of reworks for each product and each department, each month
- Number of deliveries that were late, each month
- Customer satisfaction (this can be done through a simple customer survey with quantitative ratings at regular intervals)
- Average idle-machine time (weekly or monthly)
- Amount of material waste (choose a metric appropriate to your production)
- Number of customer complaints/returned products (monthly, annually)

Frequency of data collection

As in the 'Review: Measure' section in the Productivity chapter (page 16-17), once you are collecting data monthly, you can increase the frequency and detail of the data collection to daily figures of rejects/reworking, then even hourly.

Think through as a team how best to collect this data

- How will each piece of data be collected?
- Who do you need data from and when?
- Assign responsibility to collect, report, collate and analyse data.

Some further tips on identifying defects and collecting that information is given in the Quality control/assurance section below, page 44-45)

Trending data

There should be a system to keep track of these measures on an ongoing basis, to be able to see the trends, whether the business is getting better or worse.

After using the checklists, process flow diagram and improving your measurement/metrics, you should have a clear understanding of the existing issues, their extent and where they are occurring. But where should you start? And why are these things happening?

[a] Six Sigma is a set of techniques and tools for minimising defects in manufacturing through process improvements. It was developed by engineers in the car industry and is now applied as good practice across many different industries.

2.4 ANALYSE: PRIORITIES

You have now identified a few areas for improvement from the checklists and process flow diagram. Having accurate and frequent measures in place will significantly help in determining the priority areas to focus on, and where you will get the best return for effort spent.

After your 'review' exercise, you could ask the following questions, to help you prioritise where to start:

Are there relatively more defects...

- On a particular shift?
- On a particular product line?
- Using a particular raw material?
- Producing a particular product?
- At certain times of day (dayshift vs nightshift)?
- When one person is doing quality checks rather than another?

THE PARETO PROCESS

You will have worked through the Pareto process in the productivity chapter (page 18-19), to prioritise where to start. This tool can similarly be used for quality issues.

STEP 1: LIST ISSUE AREAS

List all the areas where defects are occurring, as specifically as possible.

STEP 2: CALCULATE THE DEFECT RATE

Determine the Defects Per Unit (DPU) from each of these areas identified. The data could be collected from production sheets, feedback from a customer or any other means available.

STEP 3: COST

As a team, try to quantify the cost per defect of these scenarios. This could be in wastage of raw material, labour, transport etc, or the opportunity loss on that sale.

STEP 4: HOW MUCH PRODUCT?

Determine how much of this product is produced in a particular cycle. The cycle could be weekly, monthly or even annually, as long as you keep all the cycles for the different rows the same for this comparison.

STEP 5: OPPORTUNITY/PRIORITY

Multiply the *'DPU'* by the *'Cost Per Defect'* by the *'Total Produced'*. This will give you an 'opportunity to the business' for resolving that specific defect problem. As you can see from the table below, the highest defect rate doesn't necessary result in the largest opportunity. Similarly the highest number of units produced does not either, or the cost of a defect. It is the combination of these three that will give you the overall top priorities.

Number	Defect Trend Identified	Defects per unit	Cost per defect	Total Produced	Opportunity
1	Pealing of label on 500ml bottle produced on Line A	0.03	$15.00	100	$45
2	Overweight of product A resulting in rework	0.40	$1,000.00	10,000	$4,000,000
3	Raw material quality concerns from supplier M resulting in product rejected	0.15	$400.00	900	$54,000
4	Damaged product from machine X results in disproportion number of defects from Line Y	0.07	$0.02	500,000	$700
5	Customer complaints experienced from product using input ingredient Z	0.60	$30.00	40	$720

Pareto Process for Quality issues. Showing Steps 1-5

STEP **6**: REORDER BY PRIORITIES

Sort or re-order the rows by the figures in the 'opportunity' column, so that the top priorities are at the top of the table.

STEP **7**: COST TO RESOLVE

The exercise can be taken further by determining the cost it would take to resolve the root cause of the defect. For instance, if is going to cost your business $90 to resolve a $45 dollar problem, it may not be worth it.

STEP **8**: COST BENEFIT RATIO

Divide the figure in the 'cost' column, by the figure in the 'opportunity' column, to give a simple 'cost benefit ratio' for each row. The ones with the lowest ratio figure will give you the greatest impact for the least cost.

So you might want to start with the items that are near the top of the table, with the lowest cost/benefit ratios, for example in the table below, numbers 2 and 3.

NO	Defect Trend Identified	Defects per unit	Cost per defect	Total Produced	Opportunity	Cost to remedy	Cost to Benefit
2	Overweight of product A resulting in rework	0.40	$1,000.00	10,000	$4,000,000	$1,500,000	0.38
3	Raw materials quality concerns from supplier M resulting in product being rejected	0.15	$400.00	900	$54,000	$7,000	0.13
5	Customer complaints experienced from product using input ingredient Z	0.60	$30.00	40	$720	$800	1.11
4	Damaged product from machine X results in disproportion number of defects from Line Y	0.07	$0.02	500,000	$700	$40	0.06
1	Pealing of label on 500ml bottle produced on Line A	0.03	$15.00	100	$45	$90	2.00

Pareto Process for Quality issues. Showing Steps 6-8

STEP **9**: TAKING IT FURTHER

There are endless possibilities to expand on this type of exercise. Here are a few useful questions which could be asked together with the team:

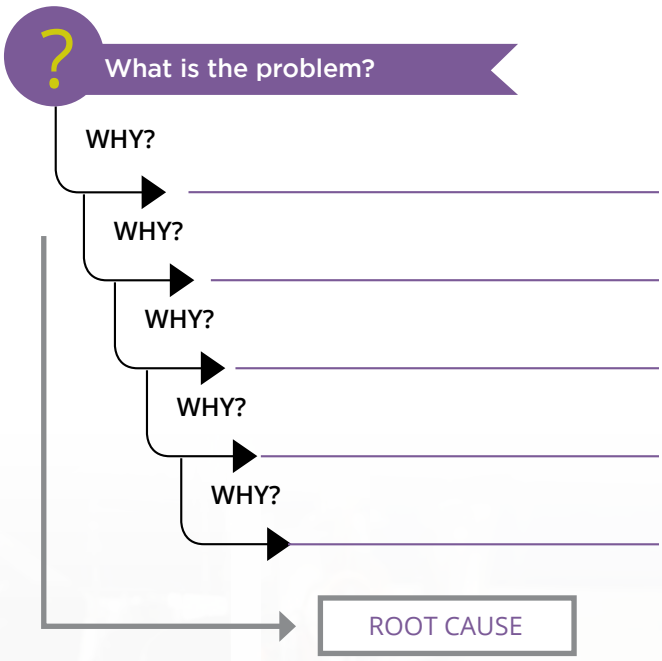
- What is an acceptable DPU target for each item identified?
- How can we reduce the cost per defect?
- How can we know sooner that the end product will be a defect, part way through the process?

2.5 ANALYSE: ROOT CAUSES

All too often businesses focus on the symptoms of a quality issue rather than the root cause. Root Cause Analysis enables you to diagnose a problem, find out the underlying issue/cause, which is essential to finding effective solutions. The '5 Whys' and the 'Fishbone diagram' are both Root Cause Analysis tools that were explained in more detail in the Productivity chapter (page 20-21).

2.5.1 ROOT CAUSE ANALYSIS: THE 5 WHY'S

Simply ask the question why, until you cannot ask it any more, or until you have got to the bottom of the real reason behind the issue.



FOR EXAMPLE:

PROBLEM: High defect rate of bottle labels.

WHY? The labels peel off easily.

WHY? The glue seems to not be holding

WHY? The quality of the glue used (Materials) is not that good.

WHY? Purchasing cheap glue from the supplier

ROOT CAUSE:

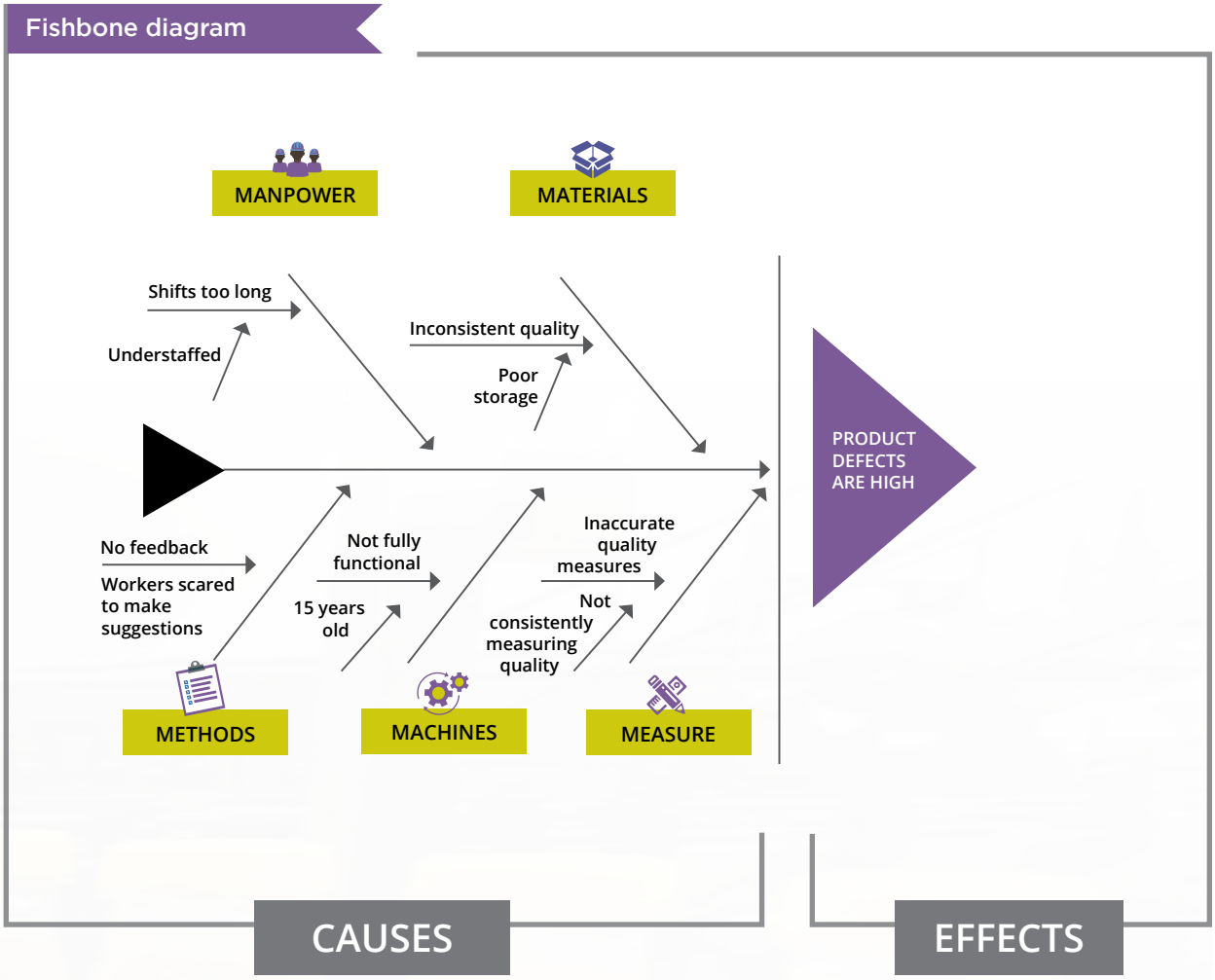
Supplier is selling a poor quality product.

THE SOLUTION:

Change supplier or specify better quality glue.

2.5.2 ROOT CAUSE ANALYSIS:
FISHBONE DIAGRAM

This tool was explained in the productivity chapter, with a worked example, please refer back to page 21. You can follow the same steps to identify, categorise and prioritise multiple 'causes' of a particular issue. The diagram below is an example of a Fishbone to tackle the problem of high defect rates with a certain product.



Now you know your key priority issues, their extent, where they are happening and why they are happening. So what are you going to do about it?

2.6 IMPROVE: TOOLS AND TIPS

Unlike in the productivity chapter, where you were encouraged to pick the tools that you thought might be useful, based on the areas where you identified issues, in this Quality chapter, you need to work through all of the subsections in this improvement section in order to make progress with quality: Objectives, Quality Control/ assurance, Problem solving and QA culture/team work.

2.6.1 IMPROVE: QUALITY OBJECTIVES

Objectives are specific, measurable goals that you can keep track of on a regular basis, by collecting data that matches **Key Performance Indicators** for each objective. You may wish to set objectives and KPIs for specific departments or even individuals. You can then measure the KPIs and have monthly report backs and problem solving sessions with teams.

The Objectives and KPIs you set will be specific to your processes and priorities but some examples are given below. [25]

Objective	Key Performance Indicator	Target	Achieved This Month
Reduce product defects	% reduction in defect rate (per month, per customer, per product)		
Reduce reworks	% reduction in reworks (per month, per customer, per product)		
Promote worker feedback	Number of worker- reported faults and defects		
	Number of worker-reported faults and defects resolved		
	Number of worker generated ideas for improving quality		
	Number of worker generated ideas for improving quality implemented		
Improve on-time delivery	% decrease in late deliveries (per month, per customer, per product)		
Improve customer satisfaction	% increase in returned customer satisfaction surveys		
	% increase in high ratings in customer satisfaction survey		
	% decrease in returned product from customer (per year, per customer, per product)		
	Decrease number of customer complaints because of quality		

2.6.2 IMPROVE: QUALITY CONTROL/ASSURANCE

Quality control / assurance is all about preventing defects, identifying defects and solving defect issues. The ILO SCORE materials referenced at the start of this chapter were useful in writing this section and provide useful further guidance on Quality Control / Assurance.

PREVENTING DEFECTS

Standard Operating Procedures (SOPs)

- Documents which give the detailed steps to be taken at each stage of any production process
- Well communicated to workers and followed closely every time, to reduce defects and errors
- Updated when a process or procedure changes
- Training provided, when necessary, to ensure that worker skills match the procedures

Product Specifications (Spec Sheets)

- Define the expectations of how a product is to be made and the quality levels that must be achieved (including all the technical details of the product, the operations breakdown, measurements and labelling requirements)
- Each production line should have spec sheets for the final product (and physical examples), as well as a spec sheet for each workstation

IDENTIFYING DEFECTS [26]

Inspections at key stages in the production process are essential in preventing, identifying and analysing defects.

- ***Pre-production inspection of input materials.*** Defective materials removed and sent back to the supplier, preventing any defective products being made from them
- ***In-line inspections of products,*** during production (if a product is being produced below specification, there should be opportunity for this to be picked up and addressed immediately rather than leaving it so that more out of spec products are produced)
- ***Post-production inspections*** on finished products before packing / shipping

Inspections can take different forms but usually include both self-examination and random sampling.

Self-examination: Each worker is trained to check the items from the prior operation before proceeding and then also check their own completed work before moving it along the line. This reduces rework and defect rates, saving time and reducing wastage. For the process to work, template examples are required for each workstation and sufficient space for examining the product. The process is as follows:

- Detect defect
- Alert next workstation and line-manager that a defect has been detected
- Send unit back to workstation where defect came from (or repair station if due to faulty machine or materials)
- Record defect for data records

(This principle of workers themselves being responsible for reporting issues also applies to 'autonomous machine maintenance', where the operator is the first line of support for the machine. This is a sign of maturity in a maintenance department.)

Random sampling: This can be done at different stages during production

- A segment of work is removed from an operator, one piece inspected, if that's fine the segment is returned.
- If one piece is faulty, a second is inspected, if the second is faulty the whole segment is examined and the operator stops work until it is resolved
- The following is recorded: number of units examined, stage of examination in production, faults found, cause of faults, actions taken to resolve issue

Consistency of quality checks: Is acceptable product being rejected on the floor because of inconsistent quality checking standards? This can be observed through inconsistent defect rates being achieved through very similar processes. For example, when Quality Checker A is on the floor, the defect rate is 0.02, but when Quality Checker B is on the floor, the defect rate is 0.10. You need to understand why this is. Possibly no change needs to be made to the process, it is rather about educating both checkers to be using the right standard.

RECORDING DEFECTS

Find the best way for your team to record defects so that you can see where most defects are coming from within the production cycle. Make sure that all workers know what to do if they find a defect or produce a defect. Ensure they feel comfortable sharing defects without fear of being punished, and have a clear process for reporting and/or recording defects.

Data needs to be collected on a continuous basis to locate issues so they can be resolved. Data could be collected through product inspection, check sheets for workers to record tallies of defects themselves, and logbook reviews. The key thing is that data is analysed and reviewed and linked to continuous improvement and problem solving, so that issues can be resolved and defect rates decreased.

Defects need to be classified to determine the urgency with which they need to be rectified.

- Critical defects – products are not usable
- Major defects – products that are not acceptable (justifying a customer return)
- Minor defects – do not make the product unacceptable but requires improvement

2.6.3 IMPROVE: PROBLEM SOLVING

Once you have a clear idea about what the quality issues are, where they are occurring in the processes, what the priority issues are and what the root causes are, you are able to bring a team together to brainstorm solutions and implement improvements.

Action plan tables

At the back of this toolkit there are action plan tables. You can use those to keep track of the actions you decide should be taken to tackle the issues you have identified. It helps to have all the actions listed in one place, with a note of who is responsible, when it should be done by and a space to write what progress has been made.

Plan-Do-Check-Act (PDCA) Cycle

This is a problem solving and implementation tool from management expert W. Edwards Deming. You can use this to manage the overall process of continuous improvement. See Productivity chapter for more detail (page 22). This tool takes you through every step of the continuous improvement process.

PLAN – Understanding the issue, the extent, the root causes and bringing an appropriate team together to come up with and agree on a potential solution, agree an implementation plan and assign actions, timelines and targets

DO – Testing the solution in a trial/small scale

CHECK – Measuring the impact of the change, getting feedback, adapting the solution if necessary

ACT – Rolling out the solution more widely if it worked well

2.6.4 IMPROVE: QUALITY ASSURANCE CULTURE AND TEAMWORK

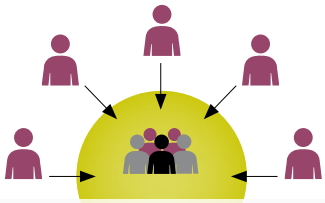
What is it?

For good quality to be integrated into the core of your business, you need to set a quality assurance culture in your business.

This means that everyone knows and believes that quality is the responsibility of all employees and not just the 'quality assurance team'.

What does it involve?

- A culture of using mistakes to learn and get better, rather than blame the fault on someone (see Worker Communication and Cooperation chapter, page 70)
- Employees at all levels encouraged and empowered to identify, solve and prevent quality issues
- Moving from being results-orientated to being process-orientated, ensuring that processes function correctly, resulting in fewer quality issues
- Focusing on making daily improvements and involving everyone in that process



TEAMWORK

To reduce quality issues your whole workplace needs to work as a team. The production workers are the people who are most likely to spot potential quality issues and also most likely to have practical suggestions for solutions. For this to work 3 things need to be in place:

- Create an atmosphere where workers feel free and welcome to speak up, knowing that their suggestions are going to be taken seriously and they won't be treated negatively for identifying an issue
- Set up a system of regular meetings where those suggestions are received
- Have a process in place for suggestions to be taken forward, actioned if management agree, and feedback given to workers on what was done

CASE STUDY
INVOLVING WORKERS IN PROBLEM SOLVING

In a factory in Asia[27], a high defect rate was identified and the management found that the Root Cause of the problem was that there was no in-line quality check. So they took the following actions:

- Reviewed existing quality policy and expectations for all production lines
- Got workers themselves involved in the review process
- Streamlined work flows and implemented a quality check system
- Did random quality checks a few times a day, and gave a reward to one worker each time
- Put up posters all around the factory with the message "Getting it right first time"

What Happened?

- Defects dropped by 50%
- Because workers were included in the process, and they saw the improvements, motivation improved and they took greater pride in their work
- Workers were then willing to engage with managers and work as a team to come up with improvement plans
- Problems were solved much faster, with more ideas from the team

ACTION PLAN TEMPLATES

Section	Issue	Action	Who needs to be involved?	Who is Responsible	When will it be done by?	Update / details	Date completed

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