Productivity Link

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Contents

Principles of Motion Economy

1. Introduction

Most workers do not enjoy making unnecessary or wasted motions, particularly if they result in unnecessary fatigue. In addition to providing some social and psychological rewards, a job should also be reasonably efficient. Motion study helps to reduce fatigue and wasted motions. It is designed to determine the best way to complete a repetitive job.

2. What is Motion Economy?

Motion economy was first used by Frank Gilbreth, and later a set of basic principles was codified by Ralph Barnes in the 1930s. The principles of motion economy comprise guidelines that can be used to help determine work method, workplace layout, tools and equipment. They make repetitive tasks easier, more efficient and more effective. These principles help to achieve productivity and their objective is to maximise efficiency, minimise worker fatigue, and reduce cumulative trauma, such as Carpal Tunnel and tendonitis, at the workstation.

The principles are used when examining and designing workstation and workplace layouts and during method study. They are simple and empirical hints on work design that are based on a combination of simple ergonomic principles and common sense. The principles relate to both the design of the workplace and the design of the work. Hence, for example, they advise that gravity should be used, where possible, to deliver materials to their point of use and to remove completed work. They include the characteristics of easy movement which suggest that working methods and workplaces should be designed such that the motion patterns required of workers can comprise movements that are minimum, symmetrical, simultaneous, natural, rhythmical, habitual, and continuous.

3. Benefits of Motion Economy

The benefits of motion economy includes:

1. It grows the ability of workers due to the application of good methods, using of good tools and eliminating unnecessary activities.
2. Extended life of machines.
3. Reduces exhaustion of workers.
4. Decreases labour costs due to less wastage in factories or plants.

4. The Principles

The principles of motion economy can be organised into three categories:

(i) Principles that apply to the use of the human body;

(ii) Principles that apply to the workplace arrangement; and

(iii) Principles that apply to the design of tools and equipment.

4.1. The Use of Human Body

(i) Both hands should be fully utilised.

- The natural tendency of most people is to use their preferred hand (right hand for right-handed people and left hand for left-handed people) to accomplish most of the work.
- The other hand is relegated to a minor role, such as holding the object, while the preferred hand works on it. This first principle states that both hands should be used as equally as possible.

(ii) The two hands should begin and end their motions at the same time.

- This principle follows from the first. To implement, it is sometimes necessary to design the method so that the work is evenly divided between the right-hand side and the left-hand side of the workplace. In this case, the division of work should be organised according to the following principle.

Table 1: Micromotion Analysis Checklist for Possible Improvements

Therblig	Questions and Suggestions
Transport empty (TE)	Minimize number of parts in the product to reduce frequency of TE and TL.
	Minimize reach distance required.
	Use parts bins that have easy access.
	Can abrupt changes in direction of movement of body member be eliminated or minimized?
	Locate parts and tools used most frequently near their respective points of use.
	Minimize requirements for hand-eye coordination during reach.
	Can right and left hands be used simultaneously to accomplish two transport empty motions?
Grasp (G)	Use parts bins that have easy access.
	Use workholders that have fast release mechanism. For example, screw type vises are time consuming to operate, while pneumatic clamps are fast-acting.
	Locate parts and tools in known locations to save time in searching.
	Can right and left hands be used simultaneously to accomplish two grasp motions?
	Avoid transfer of objects from one hand to the other.
	Design parts that do not tangle.
Transport loaded (TL)	Can parts be slid across work surface rather than carried above work surface? This usually saves time.
	Can abrupt changes in direction of movement of body member be eliminated or minimized?
	Design parts and tools to be as lightweight as possible to save move time.
	Minimize number of parts in the product to reduce frequency of TE and TL.
	Minimize move distance required.
	Locate parts and tools used most frequently near their respective points of use.
	Minimize requirements for hand-eye coordination during movement.
	Can right and left hands be used simultaneously to accomplish two transport loaded motions?
Hold (H)	This is considered an ineffective therblig. Can it be eliminated?
	Can a workholding device (e.g., fixture, jig, vise, clamp) be used instead of holding by hand?
	Can friction, an adhesive, or a mechanical stop be used instead of holding by hand?
	If holding by hand cannot be eliminated, can an armrest be provided?
Release load (RL)	Is it possible to release the object by dropping it (e.g., into a chute)?
	Is the delivery point (e.g., bin, workholder) designed for ease of release of the object?
	Minimize requirements for hand-eye coordination during release.
Preposition (PP)	This is considered an ineffective therblig. Can it be eliminated?
	Can symmetry of prepositioning be increased? For example, it is easier to preposition a round shaft relative to a round hole than a square shaft relative to a square hole because of increased symmetry of the fit.
	Can a guide be designed to facilitate prepositioning?
	Can an armrest be used to steady the hand during prepositioning?
	Design parts and tools to be as lightweight as possible to save prepositioning time.
	Make sure object is grasped properly to facilitate prepositioning.
Position (P)	This is considered an ineffective therblig. Can it be eliminated?
	Can symmetry of positioning be increased? For example, it is easier to position a round shaft relative to a round hole than a square shaft relative to a square hole because of increased symmetry of the fit.
	Can a guide be designed to facilitate positioning?
	Can an armrest be used to steady the hand during positioning?
	Can tools be suspended from overhead to avoid positioning?
	Design parts and tools to be as lightweight as possible to save positioning time.
	Make sure object is grasped properly to facilitate positioning.
Use (U)	Can a more efficient hand tool be designed to reduce the time of the use motion?
	Can a portable power tool be devised to reduce the time of the use motion?

Therblig	Questions and Suggestions
	The part should be held in a workholder during the use motion.
	Can a jig be designed to guide the use of the tool? A ***jig*** is a special workholder that has a mechanism for guiding the tool.
	Can a mechanized or automated operation be used to eliminate the need for the use motion?
Assemble (A)	Can a hand tool be designed to reduce the time required for the assembly motion?
	Can a portable power tool be devised to reduce the time of the assembly motion?
	The base part or existing subassembly should be positioned in a workholder during the assembly motion.
	Can the product be designed with fewer components to minimize assembly time?
	Design the product for automated assembly to eliminate the need for manual assembly.
Disassemble (DA)	Can a hand tool be designed to reduce the time required for the disassembly motion?
	Can a portable power tool be devised to reduce the time required for the disassembly motion?
	The base part or existing subassembly should be positioned in a workholder during the disassembly motion.
Search (Sh)	This is considered an ineffective therblig. Can it be eliminated?
	Make sure lighting is adequate to facilitate searching.
	Can parts be fed from magazines or chutes to avoid searching?
	Locate tools in known positions in the workplace to facilitate searching; for example, suspend tools from overhead.
	Can different parts be made with different colors to facilitate searching?
Select (St)	This is considered an ineffective therblig. Can it be eliminated?
	Use parts bins that have easy access.
	Make sure lighting is adequate to facilitate selecting.
	Can parts be fed from magazines or chutes for one-at-a-time selection?
	Can different parts be made with different colors to facilitate searching?
Plan (Pn)	This is considered an ineffective therblig. Can it be eliminated?
	Remove the need for the worker to decide on a course of action that causes hesitation in the work cycle.
Inspect (I)	Make sure lighting is adequate to facilitate the inspection procedure.
	Minimize the number of characteristics to inspect. Only the key characteristics of the part should be inspected. Time should not be wasted inspecting unimportant characteristics.
	Can the object be inspected using gauges instead of actually measuring the characteristics of interest? Gauging takes less time than measuring.
	Can inspection be combined with another operation so it is not performed separately?
	Can inspection be automated (e.g., machine vision) to eliminate the need for a worker to accomplish it (e.g., visually)?
	Can multiple but separate inspection steps be combined into one inspection?
Unavoidable delay (UD)	This is considered an ineffective therblig. Can it be eliminated?
	Eliminate the reason for the delay. For example, can the machine speed be increased to reduce the machine cycle time?
	Can external work elements be made into internal work elements to fill up the delay time with useful work activities?
Avoidable delay (AD)	This is considered an ineffective therblig. Can it be eliminated?
	Eliminate the reason for the delay.
	Provide incentives for the worker to minimize delay time.
Rest (R)	Reduce metabolic load on worker through the use of machines and tools to minimize need for rest breaks.
	Improvements in methods and motions through analysis of previous therbligs should reduce need for rest breaks.

(iii) The motions of the hands and arms should be symmetrical and simultaneous.

- This will minimise the amount of hand-eye coordination required by the worker. And since both hands are doing the same movements at the same time, less concentration will be required than if the two hands had to perform different and independent motions.

(iv) The work should be designed to emphasise the worker's preferred hand.

- The preferred hand is faster, stronger, and more practical. If the work to be done cannot be allocated evenly between the two hands, then the method should take advantage of the worker's best hand.

- For example, work units should enter the workplace on the side of the worker's preferred hand and exit the workplace on the opposite side. The reason is that greater hand-eye coordination is required to initially acquire the work unit, so the worker should use the preferred hand for this element. Releasing the work unit at the end of the cycle requires less coordination.

(v) The worker's two hands should never be idle at the same time.

- The work method should be designed to avoid periods when neither hand is working. It may not be possible to completely balance the workload between the right and left hands, but it should be possible to avoid having both hands idle at the same time.

- The exception to this principle is during rest breaks. The work cycle of a worker-machine system may also be an exception, if the worker is responsible for monitoring the machine during its automatic cycle, and monitoring involves using the worker's cognitive senses rather than the hands. If machine monitoring is not required,

then internal work elements should be assigned to the worker during the automatic cycle.

The next five principles of motion economy attempt to utilise the laws of physics to assist in the use of the hands and arms while working.

(vi) Method should consist of smooth continuous curved motions rather than straight motions with sudden changes in direction

- It takes less time to move through a sequence of smooth continuous curved paths than through a sequence of straight paths that are opposite in direction, even though the actual total distance of the curved paths may be longer (since the shortest distance between two points is a straight line).
- The reason behind this principle is that the straight-line path sequence includes start and stop actions (accelerations and decelerations) that consume the worker's time and energy.
- Motions consisting of smooth continuous curves minimise the lost time in starts and stops.

(vii) Use momentum to facilitate task

- When carpenters strike a nail with a hammer, they are using momentum, which can be defined as mass times velocity. Imagine trying to apply a static force to press the nail into the wood.
- Not all work situations provide an opportunity to use momentum as a carpenter uses a hammer, but if the opportunity is present, use it. The previous principle dealing with smooth continuous curved motions illustrates a beneficial use of momentum to make a task easier.

(viii) Take advantage of gravity – Do not oppose it

- Less time and energy are required to move a heavy object from a higher elevation to a lower elevation than to move the object upward. The principle is usually implemented by proper layout and arrangement of the workplace, and so it is often associated with the workplace arrangement principles of motion economy.

(ix) Method should achieve a natural cadence of the motions involved

- Rhythm refers to motions that have a regular recurrence and flow from one to the next. Basically, the worker learns the rhythm and performs the motions without thinking, much like the natural and instinctive motion pattern that occurs in walking.

(x) Use lowest classification of hand and arm motion (five classifications)

- The five classifications of hand and arm motions are presented in Table 10.5.
- With each lower classification, the worker can perform the hand and arm motion more quickly and with less effort. Therefore, the work method should be composed of motions at the lowest classification level possible.
- This can often be accomplished by locating parts and tools as close together as possible in the workplace.

Table 2: Five Classifications of Hand and Arm Motions

Classification	Defined as:
1	Finger motions only
2	Finger and wrist motions
3	Finger, wrist, and forearm motions
4	Finger, wrist, forearm, and upper arm motions
5	Finger, wrist, forearm, upper arm, and shoulder motions

The two remaining human body principles of motion economy are recommendations for using body members other than the hands and arms.

(xi) Minimise eye focus and travel

- In work situations where hand-eye coordination is required, the eyes are used to direct the actions of the hands. Eye focus occurs when the eye must adjust to a change in viewing distance. For example, from 25 inches to 10 inches with little or no change in line of sight.

- Eye travel occurs when the eye must adjust to a line-of-sight change. For example, from one location in the workplace to another, but the distances from the eyes are the same. Since eye focus and eye travel each take time, it is desirable to minimise the need for the worker to make these adjustments as much as possible. This can be accomplished by minimising the distances between objects (e.g. parts and tools) that are used in the workplace.

(xii) The method should be designed to utilise the worker's feet and legs when appropriate.

- The legs are stronger than the arms, although the feet are not as practical as the hands. The work method can sometimes be designed to take

advantage of the greater strength of the legs, for example, in lifting tasks.

4.2. The Workplace Arrangement

The following figure shows the normal and maximum working areas in the workplace.

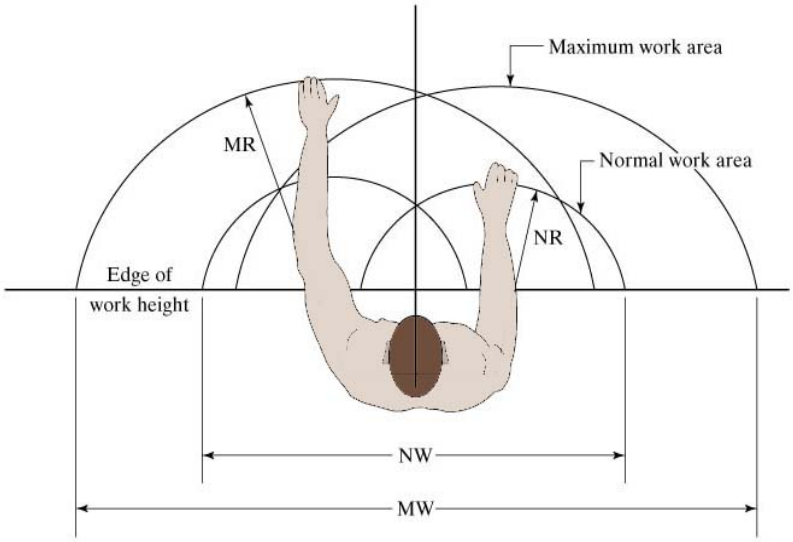


Table 3: Normal and Maximum Working Area Dimensions in Figure Above

Symbol in Figure	Dimension in Working Area for Worker Seated at Worktable	Male Worker [cm (in)]	Female Worker [cm (in)]
NR	Normal radius of arm reach	39 (15.5)	36 (14.0)
MR	Maximum radius of arm reach	67 (26.5)	60 (23.5)
NW	Normal width of arm reach	109 (43.0)	102 (40.0)
MW	Maximum width of arm reach	163 (64.0)	147 (58.0)

(i) Locate tools and materials in fixed positions within the work area

- As the saying goes, “a place for everything, and everything in its place.” The worker eventually learns the fixed locations, allowing him to reach for the object without wasting time looking and searching.

(ii) Locate tools and materials close to where they are used

- This helps to minimise the distances the worker must move (travel empty and travel loaded) in the workplace. In addition, any equipment controls should also be located in close proximity. This guideline usually refers to a normal and maximum working area, as shown in the figure above and clarified further in the table. It is generally desirable to keep the parts and tools used in the work method within the normal working area, as defined for each hand and both hands working together.

- If the method requires the worker to move beyond the maximum working area, then the worker must move more than just the arms and hands. This expends additional energy, takes more time, and ultimately contributes to greater worker fatigue.

(iii) Locate tools and materials to be consistent with sequence of work elements

- Items should be arranged in a logical pattern that matches the sequence of work elements. Those items that are used first in the cycle should be on one side of the work area, the items used next should be next to the first, and so on.

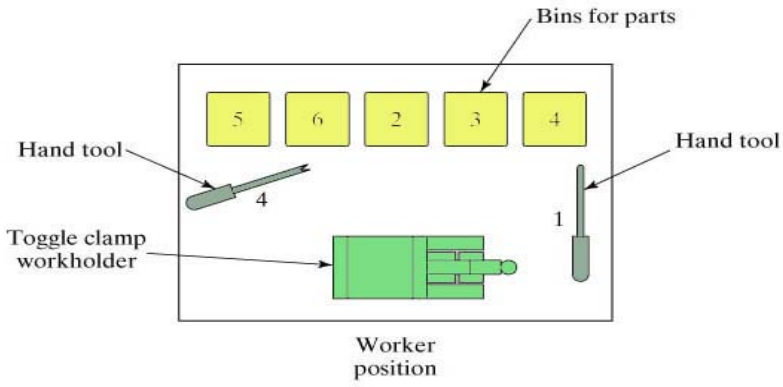
- The alternative to this sequential arrangement is to locate items randomly in the work area. This increases the amount of searching required and detracts from the rhythm of the work cycle.

- The following figure shows the top view of a workplace layout that illustrates these first three principles. Note that the layout in (b) locates bins in a more accessible pattern that is consistent with the sequence of work elements.

Illustration of First Three Principles

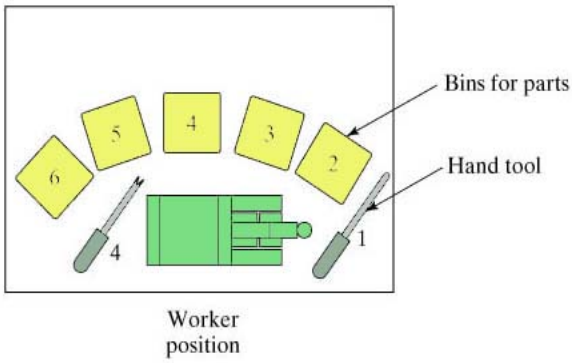
Two workplace layouts:

(a) Poor arrangement of parts and tools in workplace



(a)

(b) Good arrangement of parts and tools in workplace Numbers indicate sequence of work elements in relation to locations of hand tools and parts bins.

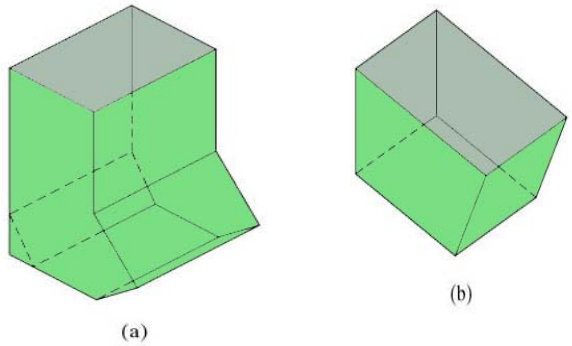


(b)

(iv) Use gravity feed bins to deliver small parts and fasteners

- A gravity feed bin is a container that uses gravity to move the items in it to a convenient access point for the worker. One possible design is shown in figure

(a). It generally allows for quicker acquisition of an item than a conventional rectangular tray shown in figure (b).



(v) Use gravity drop chutes (channels, tubes) for completed work units where appropriate

- The drop chutes should lead to a container adjacent to the worktable. The entrance to the gravity chute should be located near the normal work area, permitting the worker to dispose of the finished work unit quickly and conveniently. They are most appropriate for lightweight work units that are not fragile.

(vi) Provide adequate illumination

- The issue of illumination is normally associated with ergonomics.
- However, illumination has long been known to be an important factor in work design.
- Illumination is especially important in visual inspection tasks.

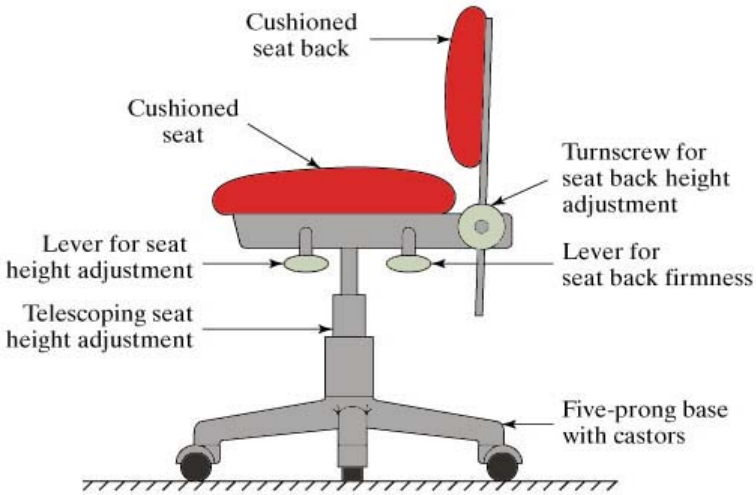
(vii) A proper chair should be provided for the worker

- This usually means an adjustable chair that can be fitted to the size of the worker. The adjustments usually include

seat height and back height. Both the seat and back are padded.

- Many adjustable chairs also provide a means of increasing and decreasing the amount of back support.

- The chair height should be in proper relationship with the work height. An adjustable chair for the workplace is shown in the following figure.



4.3. Design of Tools and Equipments

(i) Work-holding devices should be designed for the task

- A mechanical workholder with a fast-acting clamp permits the work unit to be loaded quickly and frees both hands to work on the task productively.

- Typically, the workholder must be custom-designed for the work part processed in the task.

(ii) Hands should be relieved of work elements that can be performed by the feet using foot pedals

- Foot pedal controls can be provided instead of hand controls to operate certain types of equipment. Sewing machines are examples in which foot pedals are used as integral components in the operation of the equipment.

- As the examples suggest, training is often required for the operator to become proficient in the use of the foot pedals.

(iii) Combine multiple functions into one tool where possible

- Many of the common hand tools implements this principle, such as head of a claw hammer is designed for both striking and pulling nails. Nearly all pencils are designed for both writing and erasing. Less time is usually required to reposition such a double-function tool than to put one tool down and pick another one up.

(iv) Perform multiple operations simultaneously rather than sequentially

- A work cycle is usually conceptualised as a sequence of work elements or steps.

- The steps are performed one after the other by the worker and machine.

- In some cases, the work method can be designed so that the steps are accomplished at the same time rather than sequentially.

- Special tooling and processes can often be designed to simultaneously accomplish the multiple operations.

(v) Where feasible, perform operation on multiple parts simultaneously

- This usually applies to cases involving the use of a powered tool such as a machine tool. A good example is the

drilling of holes in a printed circuit board (PCB). The PCBs are stacked three or four thick, and a numerically controlled drill press drills each hole through the entire stack in one feed motion.

(vi) Design equipment controls for operator convenience and error avoidance

- Equipment controls include dials, cranks, levers, switches, push buttons, and other devices that regulate the operation of the equipment. All of the controls needed by the operator should be located within easy reach, so as to minimise the body motions required to access and activate them.

(vii) Hand tools and portable power tools should be designed for operator comfort & convenience

- For example, the tools should have handles or grips that are slightly compressible so that they can be held and used comfortably for the duration of the shift.

- The location of the handle or grip relative to the working end of the tool should be designed for maximum operator safety, convenience, and effectiveness of the tool. If possible, the tool should accommodate both right-handed and left handed workers.

(viii) Mechanise or automate manual operations if economically and technically feasible

- Mechanised or automated equipment and tooling that are designed for the specific operation will almost always outperform a worker in terms of speed, repeatability, and accuracy. This results in higher production rates and better quality products.

- The economic feasibility depends on the quantities to be produced. In general, higher quantities are more

likely to justify the investment in mechanisation and automation.

5. Time and Motion Study

In the current dynamic business environment, companies are continually looking for methods in which to advance themselves. Innovative implementation of traditional methodologies can help businesses attain their strategic improvement goals without creating internal tension and conflict that can often, in turn, jeopardise the success of quality improvement programs. Time and motion studies have been successful in various implementations enabling companies to move forward in providing logical frameworks for improving and leaning their operations. The study is relevant today, as they were back then; to increase the efficiency of a business process.

5.1. What is Time and Motion Study?

A time and motion study is a “business efficiency” technique combining Frederick Winslow Taylor’s time study with the motion study. Time study is developed in the direction of establishing standard times. The aim of time study is to establish a time for a qualified worker to perform specified work under stated conditions and at a defined rate of working. The two techniques are integrated and refined and hence, a time and motion study is characterised by timing a worker’s series of motions and determining the optimal way in which to perform their particular job.

Historically, time and motion studies were used in the manufacturing industry to evolve pay scales with the thought that money was the only motivation for work. Today, they can be effective for performance evaluations. The studies can be used for planning purposes in order to predict the level of output that may be achieved and to help uncover problems and create solutions.

5.2. Advantages of Conducting a Time and Motion Study

Some of the advantages include:

- Eliminate or reduce ineffective movements
- Facilitate and speed effective movements

- Eliminate unnecessary work
- Determine schedules and planning work
- Determine standard cost and aid budget making
- Estimate the cost of a product
- Determine machine effectiveness
- Determine time standards for establishing wage incentive
- Determine time standards for estimating labour costs

Articles can be retrieved from NLB's e-Resources – http://eresources.nlb.gov.sg

Books are available at the Lee Kong Chian Reference Library.

Recommended Readings

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SINGAPORE PRODUCTIVITY ASSOCIATION

The Singapore Productivity Association (SPA) was set up in 1973 as an affiliated body of the then National Productivity Board, now SPRING Singapore. Its objective is to promote the active involvement of organisations and individuals in the Productivity Movement and to expedite the spread of productivity and its techniques.

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• Factors Affecting Enterprise Productivity
• Productivity Movement in Singapore
• Productivity Promotion in Businesses
• Productivity Challenges</td></tr>
<tr><td>Module 2: Productivity Tools, Techniques &
Management Systems
(Duration: 3 days)
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▪ Lean Six Sigma
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• Integrated Management Systems</td><td>Module 2: Productivity Tools, Techniques &
Management Systems
(Duration: 3 days)
• Delivering Service Excellence
• Productivity Measurement & Analysis
• Process management:
▪ Cost of Quality
▪ Lean Six Sigma
▪ Process Mapping & Analysis</td></tr>
<tr><td>Module 3: Innovation & Service Excellence
(Duration: 3 days)
• Knowledge Economy & Innovation
• Service Excellence
• Team Excellence</td><td>Module 3: Innovation & Service Excellence
(Duration: 3 days)
• Introduction to Service Excellence & Sales Productivity
• Store Management & the Roles of a Store Manager
• Minimising Operational Constraints & Focusing on Sales
• Setting Goals & Analysing Statistics
• Coaching & Motivating Sales Staff
• Service Behaviours that Encourage Business</td></tr>
<tr><td colspan="2">Module 4: Critical Success Factors
(Duration: 1 day)
• Management Commitment
• Managing & Sustaining Change
• Overcoming Resistance to Change
• Training and Education
• Planning for Implementation and Control of Productivity Improvement Programme
• Briefing on project assignment & Role of Productivity Practitioner</td></tr>
</table>

As part of the CPP curriculum, participants are required to start a productivity improvement project upon completion of the in-class component. Project guidance will be provided by a professional consultant assigned for this purpose and is for a total of 2 man-days.

Funding & Payment

The course is supported by the Singapore Workforce Development Agency (WDA). Funding is available at 70% and 50% of the course fees respectively for SMEs and MNCs/LLEs/Statutory Boards. Please find the prices payable in the net fee table below:

For SMEs:	Net Fee	Nett Fee with GST
SPA Member (S$3,700)	S$1,110	S$1,187.70
Non-Member (S$3,950)	S$1,185	S$1,267.95
For MNCs/LLEs/Statutory Boards	Net Fee	Nett Fee with GST
SPA Member (S$3,700)	S$1850	S$1979.50
Non-Member (S$3,950)	S$1975	S$2113.25

CPP Generic 2013:

January 2013		
Date	**Module**	**Time**
Wednesday, 9 January 2013	Module 1	9-5 pm
Friday, 11 January 2013	Module 2	9-5 pm
Wednesday, 16 January 2013		9-5 pm
Friday, 18 January 2013		9-5 pm
Wednesday, 23 January 2013	Module 3	9-5 pm
Friday, 25 January 2013		9-5 pm
Wednesday, 30 January 2013		9-5 pm
Friday, 1 February 2013	Module 4	9-5 pm

February 2013		
Date	**Module**	**Time**
Wednesday, 13 February 2013	Module 1	9-5 pm
Friday, 15 February 2013	Module 2	9-5 pm
Wednesday, 20 February 2013		9-5 pm
Friday, 22 February 2013		9-5 pm
Wednesday, 27 February 2013	Module 3	9-5 pm
Friday, 1 March 2013		9-5 pm
Wednesday, 6 March 2013		9-5 pm
Friday, 8 March 2013	Module 4	9-5 pm

March - April 2013		
Date	**Module**	**Time**
Wednesday, 20 March 2013	Module 1	9-5 pm
Friday, 22 March 2013	Module 2	9-5 pm
Wednesday, 27 March 2013		9-5 pm
Friday, 3 April 2013		9-5 pm
Wednesday, 5 April 2013	Module 3	9-5 pm
Friday, 10 April 2013		9-5 pm
Wednesday, 12 April 2013		9-5 pm
Friday, 19 April 2013	Module 4	9-5 pm

CPP Retail 2013:

January 2013		
Date	**Module**	**Time**
Wednesday, 9 January 2013	Module 1	9-5 pm
Friday, 11 January 2013	Module 2	9-5 pm
Wednesday, 16 January 2013		9-5 pm
Friday, 18 January 2013		9-5 pm
Monday, 21 January 2013	Module 3	9-5 pm
Thursday, 24 January 2013		9-5 pm
Tuesday, 29 January 2013		9-5 pm
Friday, 1 February 2013	Module 4	9-5 pm

February 2013		
Date	**Module**	**Time**
Wednesday, 13 February 2013	Module 1	9-5 pm
Friday, 15 February 2013	Module 2	9-5 pm
Wednesday, 20 February 2013		9-5 pm
Friday, 22 February 2013		9-5 pm
Monday, 25 February 2013	Module 3	9-5 pm
Thursday, 28 February 2013		9-5 pm
Tuesday,5 March 2013		9-5 pm
Friday, 8 March 2013	Module 4	9-5 pm

March - April 2013		
Date	**Module**	**Time**
Wednesday, 20 March 2013	Module 1	9-5 pm
Friday, 22 March 2013	Module 2	9-5 pm
Wednesday, 27 March 2013		9-5 pm
Friday, 3 April 2013		9-5 pm
Monday, 8 April 2013	Module 3	9-5 pm
Thursday, 11 April 2013		9-5 pm
Tuesday, 16 April 2013		9-5 pm
Friday, 19 April 2013	Module 4	9-5 pm

CPP Food Services 2013:

January 2013		
Date	**Module**	**Time**
Wednesday, 9 January 2013	Module 1	9-5 pm
Friday, 11 January 2013	Module 2	9-5 pm
Wednesday, 16 January 2013		9-5 pm
Friday, 18 January 2013		9-5 pm
Monday, 21 January 2013	Module 3	9-5 pm
Tuesday, 22 January 2013		9-5 pm
Tuesday, 29 January 2013		9-5 pm

Friday, 1 February 2013	Module 4	9-5 pm

February 2013		
Date	**Module**	**Time**
Wednesday, 13 February 2013	Module 1	9-5 pm
Friday, 15 February 2013	Module 2	9-5 pm
Wednesday, 20 February 2013		9-5 pm
Friday, 22 February 2013		9-5 pm
Monday, 25 February 2013	Module 3	9-5 pm
Tuesday, 26 February 2013		9-5 pm
Tuesday,5 March 2013		9-5 pm
Friday, 8 March 2013	Module 4	9-5 pm

March - April 2013		
Date	**Module**	**Time**
Wednesday, 20 March 2013	Module 1	9-5 pm
Friday, 22 March 2013	Module 2	9-5 pm
Wednesday, 27 March 2013		9-5 pm
Friday, 3 April 2013		9-5 pm
Monday, 8 April 2013	Module 3	9-5 pm
Tuesday, 9 April 2013		9-5 pm
Tuesday, 16 April 2013		9-5 pm
Friday, 19 April 2013	Module 4	9-5 pm

Core Faculty Members

MR. LAM CHUN SEE
B. ENG IN INDUSTRIAL & SYSTEMS ENGINEERING (UNIVERSITY OF SINGAPORE)

Chun see manages his own consultancy practice, Hoshin Consulting and is also an associate consultant/trainer to the PSB Corporation and Singapore Productivity Association. Prior to running his own practice, he has had years of experience as an industrial engineer with Philips, and trainer and consultant with the then National Productivity Board, APG Consulting and Teian Consulting, He was conferred the Triple-A Award in 1989 for helping to transfer Japanese know-how, particularly in the area of 5S, into local programmes and packages. Throughout his years of consultancy experience, Chun See has assisted many businesses in analyzing their productivity and quality objectives and performance; primarily through the application of the PDCA technique and basic QC tools.

MR. LEE KOK SEONG
M.SC. IN CHEMICAL ENGINEERING (IMPERIAL COLLEGE, LONDON UNIVERSITY), B.SC. IN CHEMICAL ENGINEERING (NATIONAL TAIWAN UNIVERSITY)

Kok Seong has accumulated vast experience in the areas of productivity training and management consultancy throughout his 30 years of experience with the Standards, Productivity and Innovation Board (SPRING). He has provided consultancy assistance and training for numerous organisations both within and outside of Singapore in the areas of Productivity Management, Operation and Production Management, total Quality Management, Total Productive Maintenance, Shopfloor Management, Occupational Safety Management, Industrial Engineering Applications and Supervisory Management. He has also been greatly involved in the pinnacle Singapore Quality Award (SQA) initiative since its inception in 1993. his track records include the assessments and site visits of award recipients like Micron Semiconductor (formerly Texas Instruments), Motorola, Baxter Healthcare, Philips Tuner Factory and Teck Wah Industrial Corporation Ltd. Mr. Lee is currently a certified SQA Senior Assessor, as well as a resource person for Basic and Advanced Training Courses for Productivity Practitioners, a position he has taken on since 2007.

MR. LOW CHOO TUCK
M.SC. IN INDUSTRIAL ADMINSITRATION (UNIVERSITY OF ASTON, UK); B.SC. IN PHYSICS (NUS); DIP IN QUALITY CONTROL INSTRUCTORS (INTERNATIONAL QUALITY CENTRE, NETHERLANDS); CERTIFICATE IN PRODUCTIVITY DEVELOPMENT (JAPAN PRODUCTIVITY CENTRE); CERTIFICATE IN ADVANCED MANAGEMENT DEVELOPMENT (INSEASD)

Choo Tuck currently provides training and advisory services in productivity and quality management to businesses and government in the Asean region and Middle East. He was previously the Executive Director of the Restaurant Association of Singapore as well as the Singapore Productivity Association, and was also the Director for Strategic Planning in SPRING Singapore. During his many years of service with SPRING Singapore, he gained wide experience in productivity training, management consultancy and productivity promotion, and has helped more than a 100 businesses in improving productivity, quality control and business excellence, including organisations such as Cycle & Carriage, Motorola, PUB and DBS. On top of that, he has also served as an Asian Productivity Organisation (APO) expert on Productivity for several APO member countries, and was part of a team of experts engaged by the Singapore cooperation Enterprise to provide productivity expertise to the Government of Bahrain in 2007 and 2008.

MR. QUEK AIK TENG
B.ENG (HON.) IN MECHANICAL ENGINEERING (UNIVERSITY OF SHEFFIELD); DIP. IN BUSINESS EFFICIENCY (INDUSTRIAL ENGINEERING_ (PSB-ACADEMY); CERTIFIED MANAGEMENT

CONSULTANT (CMC); PRACTISING MANAGEMENT CONSULTANT (PMC); MEMBER, INSTITUTE OF MANAGEMENT CONSULTANTS (IMC) SINGAPORE

Aik Teng currently manages his own consultancy, AT Consulting Services. One of his most recent projects includes being the LEAD Project Manager for the Singapore Logistics Association. Prior to running his own consultancy, he has been with SPRING Singapore for 20 years, and was the Head of the Organisation Excellence Department from 2004-05. He was also SQA Lead Assessor and Team Leader up till 2008 and has been involved in the SQA initiative since its inception in 1993. tasked to start up the consultancy unit within the then Productivity & Standards Board (PSB) to provide training and consultancy services to organisations, his consulting team assisted close to 30 organisations during that period. He was also involved in a project coordinated by the Singapore Cooperation Enterprise (SCE) to assist the Bahrain Labour Fund in their Labour Reform strategy, which included helping the Bahrain government to initiate a Productivity Movement as well as develop the productivity of the local enterprises. In addition, he was appointed as Project Manager to assist the Government of Botswana to implement a national Productivity Movement, from 1994 to 2003. Botswana is currently held as a model of Productivity in the Pan-Africa region.

MR. WONG KAI HONG
MBA IN STRATEGIC MARKETING (HULL), BSC (NUS)

Kai Hong is a business consultant, management trainer and company director. He has spent almost 2 decades in the consumer products industry, having worked with retailers like Isetan, Metro, Royal Sporting House, The Athlete's Foot and Sunglass Hut; brands like Reebok and Doc Martens; and technology group Wearnes Technology. He has been involved with various functions including operations, business development, project management, human resource, training, marketing, logistics, budgeting and general management. He has developed businesses in Singapore and many Asian cities such as Seoul and Beijing.

For registration or more information, write to us at CPP@spa.org.sg.
Alternatively, you could also contact our secretariat:
Ms. Angela Poh
DID: 6375 0938