SINGAPORE PRODUCTIVITY ASSOCIATION

Productivity Link

January 2012

Contents

Systematic Innovation

1. Introduction

Innovation is often linked with product design or R&D. However, this definition is "too limited". Innovation can be used as a problem-solving approach, where if it is managed correctly, would result in organic growth for the business.

Hence, systematic innovation is the process of uncovering problems which need solutions and then developing products, services, processes and business models that solve these problems.

2. What is Systematic Innovation?

Systematic innovation is "an innovation process offering organisations significant value creating opportunities". It is a structured process comprising a set of practical tools used to create, or improve, products and services that deliver new value to customers.

Systematic innovation enables anyone to be creative and potentially solve real-world problems through the application of tried and tested tools and techniques, and can be applied in both technical and business management environments for product and process innovation.

3. Benefits of Systematic Innovation

Some of the benefits include:

- Enabling businesses to re-invent itself or its offerings to ensure continued success
- Organic growth of the business as an alternative to, or in addition to, growth from mergers and acquisition (M&A)

- Improving the organisation's value proposition to current and potential customers
- Expanding existing market share and enables the organisation to enter new markets
- Focusing R&D spending on projects with high probability of commercial success
- Leveraging on the creative problem solving abilities of all employees, not just a selected few

4. TRIZ

4.1 What is TRIZ?

TRIZ (Teoriya Resheniya Izobreatatelskikh Zadatch) is the Russian acronym for Theory of Inventive Problem Solving, originated by Russian scientist and engineer Genrich Altshuller. TRIZ is "a problem-solving, analysis and forecasting tool derived from the study of patterns of invention in the global patent literature".

The theory developed on a foundation of extensive research covering hundreds of thousands of inventions across many different fields to produce a theory which defines "generalisable patterns" in the nature of inventive solutions and the distinguishing characteristics of the problems that these inventions have overcome. An important part of the theory has been devoted to revealing patterns of evolution. One of the objectives, which have been pursued by leading practitioners of TRIZ, has been the development of an algorithmic approach to the invention of new systems, and the refinement of existing ones.

The theory includes a practical methodology, tool sets, a knowledge base, and model-based technology for generating new ideas and solutions for problem solving. It is intended for application in problem formulation, system analysis, failure analysis, and patterns of system evolution.

TRIZ and systematic innovation are synonymous. Systematic innovation has taken the original TRIZ ambition of "putting all the good stuff in one place" a step further and has integrated a number of other tools and techniques into a coherent whole.

4.2 Generalised Solutions

TRIZ research began with the hypothesis that there are universal principles of creativity that are the basis for creative innovations, and that advance technology. The idea was that if these principles could be identified and codified, they could be taught to people to make the process of creativity more predictable.

Hence, TRIZ is when "somebody, in someplace has already solved this problem (or one very similar to it) and creativity involves finding that solution and adapting it to this particular problem".

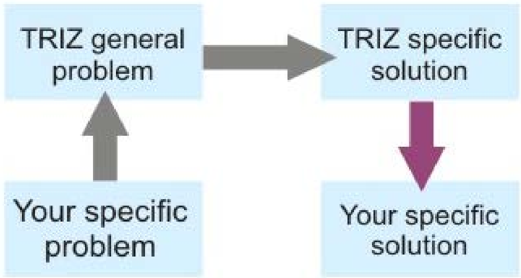
There are three primary findings of this research:

(i) Problems and solutions were repeated across industries and sciences

(ii) Patterns of technical evolution were also repeated across industries and sciences

(iii) Innovations used scientific effects outside the field in which they were developed

Much of the practice of TRIZ consists of learning these repeating patterns of problems-solutions, patterns of technical evolution and methods of using scientific effects, and then applying the general TRIZ patterns to the specific situation that confronts the developer. The figure below describes this process graphically.



Source: TRIZ: A powerful methodology for creative problem solving. (n.d.). Retrieved December 28, 2011, from http://www.mindtools.com/pages/article/newCT_92.htm

The arrows represent transformation from one formulation of the problem or solution to another. The gray arrows represent analysis of the problems and analytic use of the TRIZ databases. The purple arrow represents thinking by analogy to develop the specific solution.

4.3 Eliminating Contradictions

Another fundamental concept behind TRIZ is that at the root of many problems is a fundamental contradiction that causes it. In many cases, a reliable way of solving a problem is to eliminate these contradictions.

TRIZ recognises two categories of contradictions:

(i) Technical contradictions are classical engineering "trade-offs." The desired state cannot be reached because something else in the system prevents it. In other words, when something gets better, something else automatically gets worse.

Classical examples include:

- The product gets stronger (good), but the weight increases (bad).
- Service is customised to each customer (good), but the service delivery system gets complicated (bad).
- Training is comprehensive (good), but keeps employees away from their assignments (bad).

(ii) Physical contradictions, also called "inherent" contradictions, are situations in which an object or system suffers contradictory, opposite requirements.

Everyday examples abound:

- Software should be complex (to have many features), but should be simple (to be easy to learn).

- Coffee should be hot for enjoyable drinking, but cold to prevent burning the customer.
- Training should take a long time (to be thorough), but not take any time.

4.4 TRIZ Tools

The TRIZ solutions referred to in the figure above have been developed over the course of the 65 years of TRIZ research, and have been organised in many different ways.

Some of these are analytic methods such as:

- The ideal final result and "ideality"
- Functional modelling, analysis and trimming.
- Locating the zones of conflict (Also known as "Root Cause Analysis" to Six Sigma problem solvers)

Some are more prescriptive such as:

- The 40 inventive principles of problem solving
- The separation principles
- Laws of technical evolution and technology forecasting
- 76 standard solutions

In the course of solving any one technical problem, one tool or more can be used. One of these tools, "The 40 Principles of Problem Solving" is the most accessible "tool" of TRIZ.

4.5 The 40 Principles of Problem Solving

These 40 principles are the ones that were found to repeat across many fields, as solutions to many general contradictions, which are at the heart of many problems.

	Principle	Opposite
1	segmentation	merging (#5), integration, agglomeration
2	taking out	merging (#5); adding in
3	local quality	universality (#6); global quality
4	asymmetry	symmetry; balance
5	merging	segmentation (#1); separating
6	universality	local quality (#3); locality
7	nested doll	mutual exclusivity or mismatch
8	anti-weight	weight
9	preliminary anti-action	preliminary action (#10); afterward anti-action
10	preliminary action	preliminary anti-action (#9); afterward action
11	beforehand cushioning	afterward cushioning
12	equipotentiality	increase potentiality
13	the other way round	internally contains opposites
14	spheroidality - curvature	linearity
15	dynamics	statics
16	partial or excessive actions	this is its own opposite
17	another dimension	increase or decrease dimensionality
18	mechanical vibration	remove vibration
19	periodic action	periodic inaction; continuous action (#20)
20	continuity of useful action	periodic action (#19); continuity of useful inaction
21	skipping	do at low speed to get combination of actions
22	blessing in disguise; turn lemons into lemonade	curse in disguise; turn sugar into vinegar
23	feedback	lack of feedback; uncontrolled; positive feedback (feed forward)
24	intermediary	remove intermediary; simplify; self-service (#25)
25	self-service	single purpose device; intermediary (#24)
26	copying	avoid copies; use original
27	use cheap replacement objects	use expensive replacements, use expensive original
28	substitution for mechanical means	substitution by mechanical means
29	pneumatics and hydraulics	mechanical
30	flexible shells and thin films	rigid shells and thick slabs
31	porous materials	impermeable materials
32	color changes	use monochrome systems, use negative images
33	homogeneity	heterogeneity
34	discarding and recovering	this is its own opposite
35	parameter changes	parameter constancy

36	phase transitions	phase stability
37	thermal expansion	dimensional stability
38	strong oxidants	strong reducers
39	inert atmosphere	active atmosphere; presence of atmosphere; take away neutral parts; add active parts
40	composite materials	monolithic materials

Source: Williams, T. (n.d.). Reversibility of the 40 principles of problem solving. Retrieved December 28, 2011, from http://www.triz-journal.com/archives/1998/05/a/index.htm

Here are just a few of the principles and examples of how they could have been used to create products that were once new and innovative:

Principle	Solution
Segmentation (Divide an object into independent parts)	Individually wrapped cheese slices
Local quality (Provide different packaging for different uses)	"Adult" editions of Harry Potter books
Universality (make an object perform multiple functions)	Chocolate spread sold in glasses (with a lid) that can be used for drinking afterwards
Nested Doll	Store within store (coffee shops in bookstores)
Another dimension (Tilt or re-orient object)	Squeezable ketchup bottles that sit on their lids

Source: TRIZ: A powerful methodology for creative problem solving. (n.d.). Retrieved December 28, 2011, from http://www.mindtools.com/pages/article/newCT_92.htm

4.6 Modifications/Derivatives of TRIZ

While enhancing the TRIZ knowledge-based tools, the complex diversification of TRIZ tools and the huge knowledge base also build great barriers to people who want to learn TRIZ. Having noted this situation, some TRIZ researchers began to simplify and modify TRIZ into different versions. Systematic Inventive Thinking (SIT), Advanced Systematic Inventive Thinking (ASIT) and Unified Structured Inventive Thinking (USIT) are the most distinct representatives among them.

Simplified TRIZ Method	Description	Features Compared with TRIZ
SIT	▪ A structured method for enhancing creative problem solving in engineering design	▪ Compact and streamlined in structure ▪ More user-friendly ▪ Quicker and simpler to learn
ASIT	▪ ASIT is a creative thinking method derived from TRIZ	▪ Use a small but powerful subset of the TRIZ principles ▪ Provide unique five idea-provoking tools
USIT	▪ Depends on the adaptation from SIT method and classical TRIZ ▪ The goal of USIT is to enable a problem solver to invent multiple solution concepts in as short a time as possible for real-world problems (day-to-day technical problems in all fields) ▪ Key to this methodology is its ability to establish, quickly, unusual perspectives of a problem situation.	▪ Rapidly generate multiple conceptual solutions ▪ Consists of only simple elements or techniques

Source: Zhang, J. (2004). Systematic innovation in service design. Retrieved December 28, 2011, from http://scholarbank.nus.edu.sg/bitstream/handle/10635/13898/Zhang.J.pdf?sequence=1

Case Study

Mars

Mars, then known as Masterfoods, decided to launch a new packaging for its bitesize product range in 2003. Some of the products included in this category and made by Mars are M&M's, Maltersers, Minstrels, Revels, and Mars Planets.

Source: Oxford Creativity. (n.d.) TRIZ case study - Improving the opening of the bitesize pouch at Mars. Retrieved December 28, 2011, from http://www.triz.co.uk/files/triz_case_study_-_pouch_opening_at_mars.pdf

The packaging change involved moving from a standard pillow bag to a standing pouch. The change had several goals, with an overall aim to increase sales for Mars:

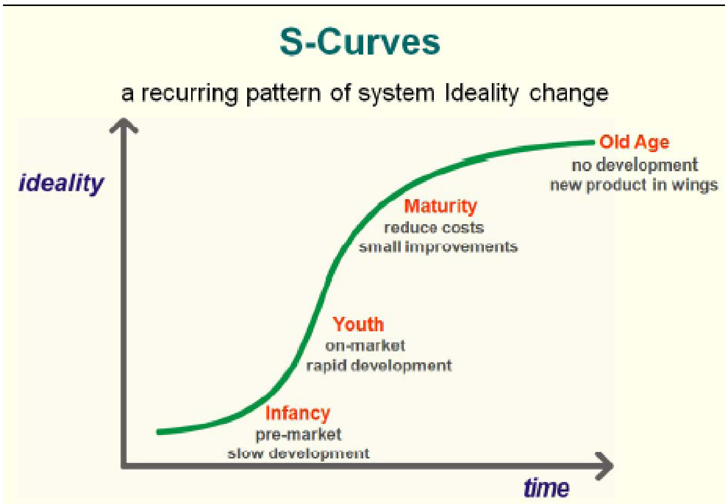
- move from a horizontal pack to a vertical pack to get better visibility on shelf
- enhance the sharing experience by allowing the pouch to stand on a table with a wide opening where consumer could put their hand in to take the product, or pass it around to friends
- offer a straight and easy opening that could be re-closed with a sticker (which is attached at the back of the pack)
- make the tear strip (upper part of the pouch) easily removable so it does not block the hand getting inside the pouch and does not alter the aesthetic of the pouch once it opens

A multi-disciplinary team identified the best packaging machine and packaging material to deliver the concept. A micro-perforated line on both sides of the pouch near the easy opening line printed on the design would result in a straight opening. After launching the new packaging, sales increased and the packaging was a market success.

The new packaging changed the way people viewed the bite-size segment and many competitors designed their own version of the pouch or copied the Mars product by buying the same packaging machine. The entire market was affected creating a shift from the standard pillow bags or poor quality standing bags to more premium packs.

The Problem

Although the new packaging was on the market, it was still in its infancy stage and needed improvements. The S-curve in the figure below provides a visual of the stages of product development.



Source: Oxford Creativity. (n.d.) TRIZ case study - Improving the opening of the bitesize pouch at Mars. Retrieved December 28, 2011, from http://www.triz.co.uk/files/triz_case_study_-_pouch_opening_at_mars.pdf

The new packaging failed to meet a key consumer attribute – it still did not open in a straight line, affecting the aesthetics. When the consumer tore the pouch open the tear did not follow the perforations, as shown in the picture below. The tear lines were erratic and the front and back tears did not connect at the edge of the pouch. As a result, removing the tear strip was difficult and the opened pouch looked awful. The development team needed to fix this before the product could reach the maturity stage on the S-curve.

Source: Oxford Creativity. (n.d.) TRIZ case study - Improving the opening of the bitesize pouch at Mars. Retrieved December 28, 2011, from http://www.triz.co.uk/files/triz_case_study_-_pouch_opening_at_mars.pdf

The back tear followed the perforation line, but the front tear travelled toward the lower side of the pouch making it difficult to remove the tear strip where it remained attached by at least a two centimetre seal. This problem was enhanced when the pouch had a Euroslot – a hole on the package allowing the product to be hung on a display rack.

The development team tested the performance of the packages and the results were unsatisfactory:

- Only 5 percent of the packages without a Euroslot opened straight and none of the packages with the slot opened straight.
- The torn strip was not easily removed on any of the packages.
- The average distance between the front and back tear lines was 15 millimetres for the regular pouch and 30 millimetres for the Euroslot bags.

The team attempted using a standard trial-and-error method to solve the problem. Although this method may be a result of the natural evolution of the human mind, it is not perfect and can require significant time before attaining the right solution. As Genrich Altshuller, the father of TRIZ, wrote in his book The Innovation Algorithm: "During the process of evolution, our brain learns to find approximate solutions to simple problems. However, it does not develop mechanisms of slow and precise solutions to complex problems."

The problem was that the inadequate opening impacted a key consumer attribute: the problem needed to be quickly solved.

The development team joined the suppliers in the process during the trial-and-error phase, but soon realised that little could be done to change the material itself. While there were many different film structures and combinations of films with the proper tear properties available on the market, the team faced two problems when it attempted to change the materials: 1) the line efficiency was affected because of the friction generated during the tear or 2) the packaging lost the necessary heat-sealing properties. It became evident that changing the film was not the right solution. Changing the film perforation was not helping either, because the tear did not follow the perforations.

The development team conducted brainstorming sessions in an attempt to find the solution. But again, as Altshuller wrote in his book, "Brainstorming does not eliminate chaotic searching. In reality it makes searching even more chaotic. The absurdity of brainstorming as a searching process is compensated for by its quantitative factor – problems are attacked by a large team. Any gain here is achieved only through the reduction of inefficient attempts along the direction of the Inertia Vector."

The team was not finding a real step change and needed a new direction. To be quick, efficient and successful, they needed something different, powerful and able to direct their problem solving in a more heuristic way – they needed TRIZ.

Solving the Problem with TRIZ

TRIZ was not new to Mars in 2004. Some were trained in TRIZ and the company had previously used TRIZ tools to solve a problem in the coffee machine segment. But, the company had stopped using it and lost its competency. People worked in an emergency mode using trial-and-error and brainstorming methods. Some problem solvers thought using a specific problem solving method was too difficult and/or time consuming.

The development team, however, recognised the potential of TRIZ as a problem solving methodology. The project manager, a TRIZ convert and a TRIZ advocate, worked to establish a TRIZ culture and thinking process within Mars.

The first thing that the team did was to set the problem and understand what they wanted – the ideal outcome.

The team wanted:

1. Material to tear horizontally instead of toward the top or bottom of the pouch.
2. Material to tear horizontally and not stop when it reached the Euroslot.
3. Tear to follow the shape of the Euroslot but not stop on it.
4. Tear to follow the sealing line but not stop on the Euroslot.
5. Both walls to be under tension instead of only the side being torn.
6. Tear on the front and back of the pouch to meet on the other side of the pouch. When the two tears meet the consumer can easily remove the tear strip. The greater the distance between the tears, the more difficult it is to remove the tear strip.
7. If the two walls are near each other at the top of the pouch, the tear is straight. Farther down on filled pouch the product moves the walls apart and the tear is no longer straight.
8. When the pouch had a Euroslot, the tear line was lower on the pouch, and the distance between the walls was greater, resulting in a worse tear.

The development team summarised the ideal outcome as a product that allowed a consumer to:

- Be able to remove easily the tear strip, both tears (at the front and back side of the pouch) must attain the opposite lateral seal at the same position (same height
- Tear the pouch open in a straight line, which meant the two walls must be as close to each other as possible, as the distance between the walls impacts the tear direction

Now that they had an idea of the ideal outcome and what was happening during the tearing action, they decided to map their system within the TRIZ Time-Scale matrix to have a clear overview of their system, the super-system, the sub-system and their relation to each other:

Time

Scale

Supplier manufacturing Process	Film on reels	Haguenau Pouch making machine
Each individual Pouch Wall	The two walls together + side notch	The Pouch open
Perforation Film molecules	Perforation Film molecules	Perforation Film molecules

Source: Oxford Creativity. (n.d.) TRIZ case study - Improving the opening of the bitesize pouch at Mars. Retrieved December 28, 2011, from http://www.triz.co.uk/files/triz_case_study_-_pouch_opening_at_mars.pdf

The development team used the TRIZ 76 standards to determine what could be done within the different parts of the system to straighten the tear. The first standard the team used was: Stop a harmful action being harmful: change the object so it is non-sensitive to the harmful action. To change the object so it becomes non-sensitive to the harm, the team needed to hang the pouch from two separate walls into only one. When the walls are connected the tear is straight.

The team had several ideas for how to do this at the various system levels:

System Level:

- Put coldseal on each side of the wall. When they touch each other, they become one
- Seal the area where you want the tear to happen (heatseal or ultrasonic seal)
- Extract the air so both walls are close to each other
- Use a zipper
- Use a multi-layer laminate (Triplex)
- Use static electricity
- Velcro
- Void inside the Pouch to attract the walls together

Sub-System:

- Use a non deformable material
- Use more rigid material

- Change the material orientation (molecular level)

The second of the 76 standards was: Add another action to intensify/ supplement the effect/ action or add a new (second) field which is more easily controlled. The intent is to improve the efficiency of the perforation, because it is currently insufficient − the tear does not follow it.

Super-system Level (supplier process):

- Fancy cut system (increase the number of perforation lines)
- Laser cut (new field)
- Change the shape of the cuts (seesaw type like on boxes)

System Level:

- Cut completely one part of the laminate instead of just perforating it
- Make half cuts like on cardboard
- Change the position of the tearing notch

The team used a third standard: Stop a harmful action being harmful: counteract the harmful action with an opposing field:

Super-System Level (Pouch making machine):

- Create a thickness in the side walls to stop the tear getting down
- Weaken the material at the side seal level so we can remove the tear strip even if the tears on each wall do not come to the same position on the opposite side.
- Add material or glue during Pouch forming process

System level:

- Add something on the side walls to guide the opening
- Use the reclose sticker to guide the opening

- Remove the glue on partial areas to block the tear line
- Use two different glues
- Stress cracking: high or low temperature effect, with or without pressure
- Change the shape of the Euroslot

During this case study the team used three of the 76 standards and some of the 40 principles of the contradiction matrix − segmentation, in particular. After their analysis of the standards and principles the team met with the suppliers to develop a plan to industrialise the solutions.

Industrialisation of the concepts:

When they met with their suppliers, they explored the different concepts one by one to see which would solve the problem.

Some of the concepts are:

(i) Material:
  - Orientation (no bubble effect)
    The idea was to check if they could block the bubble effect generated by the blown to make one use of the material used in the structure.
  - Rigidity
    - Thicker film
    - More rigid film
    - More layers

(ii) Make the two pouch walls getting close together (walls glued after the pouch is made) using cold seal points.

(iii) Guiding the opening better:
  - Improvement of micro-perforation:
    - Cutting a different layer
    - Cutting different sides in an alternate way
    - Several parallel lines

(iv) Creating artificial thicker areas (to guide the opening like a ruler):
  - Thicker lamination glue areas
  - Change the flue type
  - Hardening varnish

- Combination of glue and varnish

The Winning Idea

Testing and validating these ideas was a lot of work. The most original, clever and easy-to-implement idea eliminated the glue from the laminate in the tear area allowing the tear to stay within the opening area. The development team implemented this idea. The most difficult step in the development process was convincing the suppliers to test it. Initially they rejected the idea, but after several trials the solution was validated.

In the final product three lines were added to each side wall to allow for variation in the forming of the pouches. The tear travelled through the middle of the area. If the tear moved away from a straight line, it fell inside the glue-free area and was guided back to the intended tear line.

As the principle was quite unique and to ensure a proper protection, the team had the idea patented.

Source: Oxford Creativity. (n.d.) TRIZ case study - Improving the opening of the bitesize pouch at Mars. Retrieved December 28, 2011, from http://www.triz.co.uk/files/triz_case_study_-_pouch_opening_at_mars.pdf

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

Terninko, J. (1998). *Systematic innovation: An introduction to TRIZ*. Boca Raton: St. Lucie Press.
[RBUS 658.575 TEN]

Savransky, S. D. (2000). *Engineering of creativity: Introduction to TRIZ methodology of inventive problem solving.* Boca Raton: CRC Press.
[RBUS 620.0028 SAV]

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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.

SINGAPORE PRODUCTIVITY ASSOCIATION

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▪ Lean Six Sigma
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• Briefing on project assignment & Role of Productivity Practitioner</td></tr>
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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

The schedule of our next runs is as follows:

CPP Schedule:

April - May 2012		
Date	**Module**	**Time**
Wednesday, 11 April 2012	Module 1	9-5 pm
Friday, 13 April 2012	Module 2	9-5 pm
Wednesday, 18 April 2012		9-5 pm
Friday, 20 April 2012		9-5 pm
Wednesday, 25 April 2012	Module 3	9-5 pm
Friday, 27 April 2012		9-5 pm
Wednesday, 2 May 2012		9-5 pm
Friday, 4 May 2012	Module 4	9-5 pm

May - June 2012		
Date	**Module**	**Time**
Wednesday, 30 May 2012	Module 1	9-5 pm
Friday, 1 June 2012	Module 2	9-5 pm
Wednesday, 6 June 2012		9-5 pm
Friday, 8 June 2012		9-5 pm
Wednesday, 13 June 2012	Module 3	9-5 pm
Friday, 15 June 2012		9-5 pm
Wednesday, 20 June 2012		9-5 pm
Friday, 22 June 2012	Module 4	9-5 pm

CPP (Retail) Schedule:

April - May 2012		
Date	**Module**	**Time**
Wednesday, 11 April 2012	Module 1	9-5 pm
Friday, 13 April 2012	Module 2	9-5 pm
Wednesday, 18 April 2012		9-5 pm
Friday, 20 April 2012		9-5 pm
Tuesday, 24 April 2012	Module 3	9-5 pm
Thursday, 26 April 2012		9-5 pm
Thursday, 3 May 2012		9-5 pm
Friday, 4 May 2012	Module 4	9-5 pm

May - June 2012		
Date	**Module**	**Time**
Wednesday, 30 May 2012	Module 1	9-5 pm
Friday, 1 June 2012	Module 2	9-5 pm
Wednesday, 6 June 2012		9-5 pm
Friday, 8 June 2012		9-5 pm
Tuesday, 12 June 2012	Module 3	9-5 pm
Thursday, 14 June 2012		9-5 pm
Tuesday, 19 June 2012		9-5 pm
Friday, 22 June 2012	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. Ne 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. Leanne Hwee Mr. Ashton Chionh
DID: 6375 0938 DID: 6375 0940