

# **Results Of A Multi-Company Scale TRIZ Deployment In Hong Kong**

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## **Overview**

This article presents a summary overview of a recently completed, 12-month duration programme to deploy TRIZ-based tools in a number of companies in Hong Kong and China.

Given the importance of innovation and creativity, together with intellectual property as strategic weapons for corporations to gain competitive advantage, the concept of 'systematic innovation' provided the initial seed from which a programme of deployment grew. With the migration of local businesses from Original Equipment Manufacturing (OEM) to Original Design Manufacturing (ODM) and Original Brand Manufacturing (OBM) coupled with the recent CEPA initiative, it is increasingly vital for local companies to differentiate and protect themselves through strong brands with distinct innovative content. TRIZ was selected as a successful enabler for companies to systematically enhance their innovative potential.

It was the aim of this project to transfer important elements of the TRIZ technology to Hong Kong industry. As part of the pilot company programme eight companies were selected from a wide range of Hong Kong's industries. The pilot companies were introduced to a locally-tailored version of the TRIZ methodology through a series of workshops and hands-on problem solving sessions over a nine month period. Each of the eight companies used the method to generate new products, solutions and processes for their companies and documented some of their results in a series of case studies.

During the last three months of the programme, the results obtained from the eight companies were promoted to Hong Kong industry through a dissemination programme. An international seminar and a series of hands-on workshops in Hong Kong and South China were delivered by the overseas consultant and HKPC consultants to a wide range of Hong Kong's major industrial groups. Broader dissemination has also been facilitated through the production and circulation of a CD-Rom.

## **1.1 Introduction**

Over the past ten years the TRIZ has been applied in many multi-national corporations. Highly innovative companies such as Samsung, Hitachi, Siemens and 3M have begun to report significant successes having applied TRIZ to various parts of their businesses. [1,3]

SMEs have also been reporting significant benefits from the application of TRIZ [1]. To date, however much of the TRIZ activity has been concentrated in the United States and Europe.

This project looked at applying the method specifically to SMEs located in Hong Kong (SAR).

In the context of Hong Kong, innovation and creativity have recently been much talked about as strategic weapons in the battle to gain and maintain competitive advantage. This is highlighted by the recent migration of local businesses from OEM manufacturing to higher value ODM and OBM manufacturing. Many small and medium sized companies however, are not aware of methodologies for assisting in such activities.

In order to gauge the actual response to the methodology on a practical level, prior to the commencement of the project, a number of public events were staged. In total, more than 300 engineers, designers and managers received introductory lectures and seminars from HKPC consultants. An education programme was also carried out with some 80 students from undergraduate and post-graduate programmes from the Hong Kong Polytechnic University and the City University of Hong Kong being introduced to TRIZ. The positive feedback received from both industry and academia suggested a keen local interest in TRIZ and its reported benefits. The feedback underlined the relevance of TRIZ to Hong Kong industries needs and as a result the project being reported here was developed.

## **1.2 Objectives**

The objectives of the project were:

- a) To introduce and promote the TRIZ method to local industry
- b) To strengthen the innovative potential of Hong Kong's SMEs through training and mentoring in the use of structured problem analysis and methods for generating breakthrough ideas
- c) To improve the local awareness of Intellectual Property and how to use it as a key business driver
- d) To disseminate best practice use of the customized methodology to industry throughout Hong Kong
- e) To enable companies to quickly learn the basics of the methodology and to efficiently implement it into their working practices
- f) To generate a number of real case study examples of successful application of the methodology within the eight companies.

## **2.0 Programme Structure**

Due to the number of companies interested in the programme a list of selection criteria was developed by the overseas expert and HKPC consultants. Eight companies were selected to participate in the programme having been assessed against the following criteria:

- A Hong Kong registered manufacturing company
- A portfolio of products with innovative content or a desire to shift from OEM to ODM/OBM
- Significant design input in the products
- A clear desire to develop new innovative products
- The use of, or a desire to use, intellectual property in the future business strategy

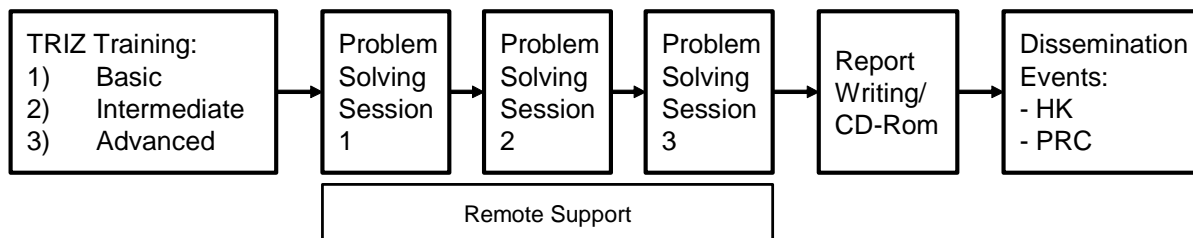
Having selected the eight pilot companies, each company was asked to put together a project team of 4 to 5 members. The companies were encouraged to construct teams that had a mix of expertise from engineering, marketing and management functions.

Each team was asked to assign a project leader. The project leaders were responsible for reporting the progress of the teams and championing TRIZ within their companies.

In order to objectively quantify the outcome of the programme a number of success factors were defined prior to commencement of the programme. These success factors were used to assess the effectiveness of the TRIZ method specifically for Hong Kong SMEs. The specific success factors developed by the overseas expert and the HKPC consultant team were:

- No of patentable ideas generated
- No of patent applications submitted
- HK\$ savings resulting from TRIZ activities
- HK\$ additional business generated as a direct result of the TRIZ activities
- HK\$ cost benefits from solving an on-going company problem

The pilot programme introduced TRIZ to the eight pilot companies through intensive taught sessions and hands-on workshops over a period of nine months. The sessions were run by the overseas expert and HKPC consultants. Each company received three, three-day training sessions covering Introductory, Intermediate and Advanced level TRIZ. These sessions were separated by a period of around one month. Delegates were expected to conduct 'homework' projects during the period between each session. The overall programme structure is illustrated in Figure 1:



**Figure 1: Overall Programme Structure**

The eight pilot companies all received three additional, three-day hands-on problem solving sessions. Each company received one copy of the CREAX Innovation Suite 3.1 software [5] to assist them in the problem solving process.

Through these sessions the pilot companies were taught the TRIZ theory and then allowed time to apply the theory to their own in-company products and problems. Guidance was provided at all stages from the overseas consultant and the HKPC consultant team. Regular presentation sessions were scheduled to allow each pilot company to share their experience and solutions with the other teams.

## **2.1 Pilot Company Information**

The eight participating pilot companies selected for the programme (Figure 2) were as follows:



**Figure 2: Pilot Company Problem Solving Sessions**

### **ASAT Limited**

ASAT Limited is global provider of semiconductor assembly and test package design services. The company has 15 years experience, and offers a definitive selection of semiconductor packages and world-class manufacturing lines. ASAT's advanced package portfolio includes standard and high thermal performance ball grid array and leadless plastic chip carriers, thin array plastic packages, system in package and flip chips.

The company has operations in the United States, ASIA and Europe. ASAT Inc. is a wholly owned subsidiary of ASAT Holdings limited and the exclusive representative of services in North America.

### **Clipsal Asia Limited**

Established in the 1920's Clipsal Asia Limited (CAL) is principally engaged in the manufacture and distribution of electrical wiring devices and installation systems (EWDIS) in Asia. It has a significant presence across Asia, with manufacturing operations in China, Malaysia, Indonesia, Vietnam, the Middle East, and a sales network covering more than 15 countries in Asia. It is the sole and exclusive manufacturer and distributor of EWDIS products under the "CLIPSAL" brand in 31 countries in Asia. CLIPSAL offers more than 20,000 different products across a broad range of domestic, data, industrial and automation products.

### **Nanma Manufacturing Company Ltd.**

N.M.C. Ltd. is one of Asia's largest manufacturers and distributors of massage and health care products. Established in 1980 N.M.C. Ltd. employs more than 60 employees in Hong Kong and more than 700 within its factory in Guangzhou, South China. Its advanced manufacturing facility in South China produces products for major markets such as the USA and Europe.

### **Orient Power Multimedia Ltd.**

The Orient Power Group is a global supplier of consumer electronics products. The principal activities of the Group are development, manufacture, sales and distribution of audio and video products for automobiles and the home. Established in 1984 Orient Power currently has 15,500 employees across its sites in Hong Kong (SAR), the PRC and the USA.

**Printrite Technology Development Co., Ltd. of Zhuhai**

Print-rite Technology Development Co., Ltd of Zhuhai (PRTech) is a subsidiary company of PrintRite Holdings Co. Ltd. PRTech, founded in 2004 is a technology development corporation employing 29 staff in Hong Kong and the PRC. PRTech specializes in developing image products from ribbon and inkjet products to laser cartridges.

**Samsam Productions Ltd**

Founded in 1987, Samsam Productions Ltd is one of the leading manufacturers of gift wrapping products. Samsam spearheads a strong trend of innovative and sensory packaging with creative ideas, attractive design, surface treatments, state-of-the-art printing techniques and new product development. Samsam provides a one-stop shop service that includes precision design, printing, manufacturing and packaging utilising advanced equipment. Samsam employs 1,000 staff across its Hong Kong and PRC sites.

**Starlight International Holdings Ltd.**

Star Light Electronics Co., Ltd. ("Starlight") is one of the leading manufacturers and distributors of Audio & Video electronics. Starlight has its own vertically integrated manufacturing facilities in Panyu and Nantou, PRC. Being a consumer electronics OEM manufacturer with over 30 years of manufacturing experience, it has established long term relationships with various world-renowned customers, such as Philips, Sony, Sharp, Hitachi, Thomson, Grundig, AKAI and Samsung.

**VTech Telecommunications Ltd.**

Founded in 1976, VTech Telecommunications Ltd. is a leading cordless telecommunication product manufacturer and distributor. With headquarters in the Hong Kong Special Administrative Region ("HKSAR") and state-of-the-art manufacturing facilities in mainland China, VTech currently has a presence in 10 countries and approximately 22,700 employees, including around 880 R&D professionals in R&D centres in Canada, Hong Kong SAR and mainland China.

### **3.0 Results Overview**

Throughout the duration of the project the implementation team has seen a great deal of progress from all the companies involved in the ITF sponsored programme. The projects carried out by the companies were extremely varied and all demonstrated successes in line with the success factors defined prior to the commencement of the project.

It was particularly interesting to see how each company used the TRIZ method in different ways to achieve successful solutions. Nanma, Starlight, and Clipsal applied the TRIZ method to successfully develop new innovative breakthrough products. Samsam and ASAT used the TRIZ method to solve specific technical problems related to their manufacturing processes. OP and Starlight used the method to look at cost reduction. Vtech used the method to identify and protect key intellectual property for the future development of the company and PrintRite used the method to create new intellectual property, better protect their ideas and ensure the generated ideas did not infringe other patented ideas.

From the eight companies that participated in the programme, a considerable number of patentable ideas were generated, half a dozen of which are currently in various stages of the patent application process. Total cost savings in the region of HK\$2.5 Million have been reported by the companies. Furthermore, HK\$15.5 Million of additional business has been generated as a direct result of the programme.

All eight participating companies achieved successes against the success factors defined prior to the project commencement emphasizing the huge potential of TRIZ in Hong Kong small and medium enterprises.

### 3.1 Company Testimonials

*“Through the TRIZ training, our company’s top engineers have learnt a new systematic method to be creative and innovative. They will train their 70 plus engineers in how to use TRIZ to solve many day to day problems. They also found out that TRIZ was particularly helpful with mechanical problems and also with cost reduction. We also hope to train our factory staff to learn TRIZ in order to tackle wastage in the factory.”*

Starlight International Holdings Ltd.

*“The TRIZ programme has been extremely valuable to our company. Direct benefits of the TRIZ programme included the development of much stronger Patent applications. We will be applying the TRIZ method to all our future development projects”*

Nanma Manufacturing Company Ltd.

*“The TRIZ programme has been extremely valuable to ASAT. Indirect benefits are that the engineering team can use the methods back in the company to develop more ideas of this innovative nature. The future R&D plan will reference the TRIZ tools and method. We plan to use TRIZ over the coming years to serve as a tool in developing new projects for improving our assembly process yields, quality, cycle time, package designs/reliability and other cost saving projects. Successful deployment of any of these solutions looks set to reinforce the long-term competitive position of the company.”*

ASAT Limited

*“The team plans to continue to use TRIZ in the development of new products and to assist in solving manufacturing and distribution problems.”*

Orient Power Multimedia Ltd.

*“TRIZ has been extremely useful to our company. It has not only taught us how to generate innovative ideas but has assisted us in systematically finding innovative solutions to our on-going problems. Our team is now better positioned creatively to generate breakthrough concepts.*

Clipsal Asia Limited

*“TRIZ will definitely be used in a number of different functions in the future.”*

VTech Telecommunications Ltd.

*“TRIZ has helped the production engineering team extensively. The TRIZ process has introduced a procedure for identifying and then solving problems in both manufacturing and product development. It was found to be extremely useful in developing new product concepts as well as solving manufacturing process problems.”*

Samsam Productions Ltd.

*“The TRIZ programme has been extremely valuable to our company. We plan to use TRIZ extensively over the coming years to develop new projects. We plan to grow the TRIZ team from its current 5 members to a further 5 over the next 6 months. We also plan to introduce TRIZ to other departments within the company such as engineering, marketing, production and industrial design over the next twelve months. TRIZ has proved to be an excellent method for our company and will be pivotal to helping it achieve its mission. We have put processes in place to ensure TRIZ is used by project team members at various stages in the product development process.”*

Printrite Technology Development Co., Ltd. of Zhuhai

## 3.2 Example Case Study – Star Light Electronics Co Ltd.

Each company involved in the programme was expected to write-up at least one of their case studies. These may be found on the CD-Rom output (details of how to access at the end of this article). In order to provide a flavour of the work conducted, we present here a summary overview of one of those case studies, a Next Generation Home Karaoke Entertainment System:

### 3.2.1 Introduction

The project was to develop a new innovative home karaoke audio/video product that would generate additional revenue for the company. The maximum development lead time for the new product was given as nine months and the new product must not require any manufacturing technologies currently unavailable to the company.

### 3.2.2 Problem Definition

Starlight's major market for Karaoke systems is the USA and of this market a large percentage of the customers are children and teenagers aged between 10 and 15 years old. Current home karaoke systems on the market are generally multi-disc DVD players with a small number of additional features that include audio control for the microphone inputs. Typically the karaoke system is connected to a display and speakers through an amplifier or simply played through the display device speakers. Microphones are connected to the karaoke system through audio jacks at the front of the device. Additionally, a remote control is typically supplied to control the sound and disc operation. The resulting system is one that is relatively complex, consists of a large number of components, is difficult and time consuming to setup, and difficult to store when not in use. A system more suitable for young people was required.

The team began by building a functional diagram of the current system:

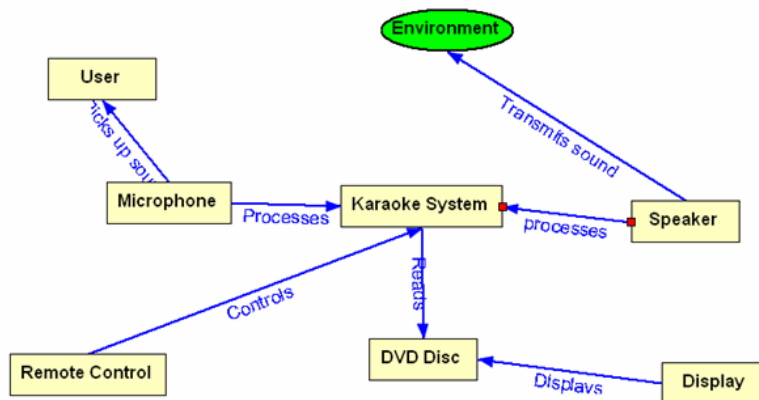


Figure 3 – Function and Attribute Analysis Diagram of a Current Karaoke System

The aim of the project was to improve the existing Karaoke systems in the market by increasing the value of the product and decreasing its complexity.

### 3.2.3 Solution Generation

From an analysis of the functional model the project the team identified a major design contradiction. The aim of the project was to simultaneously decrease complexity and increase the customer functionality. This contradiction was mapped to the contradiction matrix as follows:

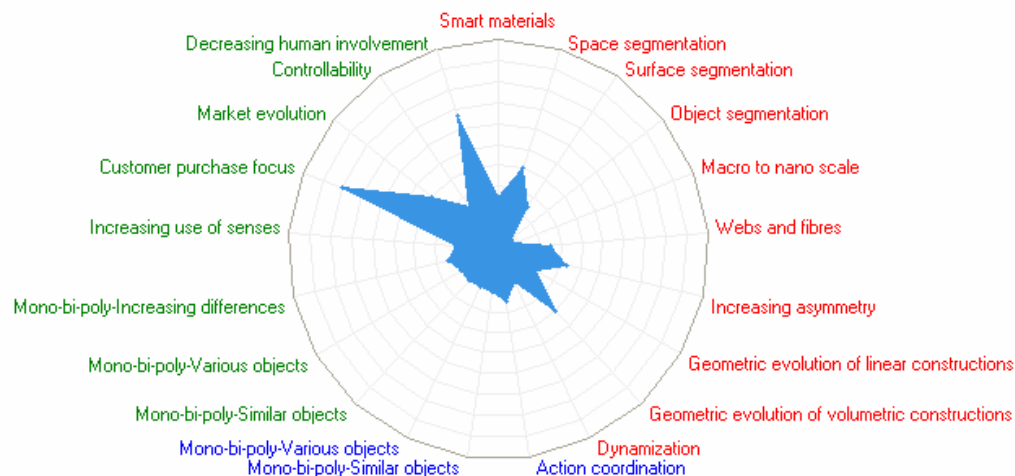
Improving Factor	Worsening Factor	Principles				
Adaptability or Versatility (35)	Device Complexity (36)	15	29	37	28	
Describe your conflict						

**Figure 4: Mapping the Problem to the Contradiction Matrix**

Principles 15 “Dynamize” and 28 “Mechanics Substitution/Another Sense” were suggested by the contradiction matrix as solution triggers for resolving this contradiction. Principle 28 suggests making use of another sense, optical, acoustic, taste, touch or smell. This prompted the team to consider, among other ideas, encapsulating some of the control features into the screen of the device improving the usability and complexity of use.

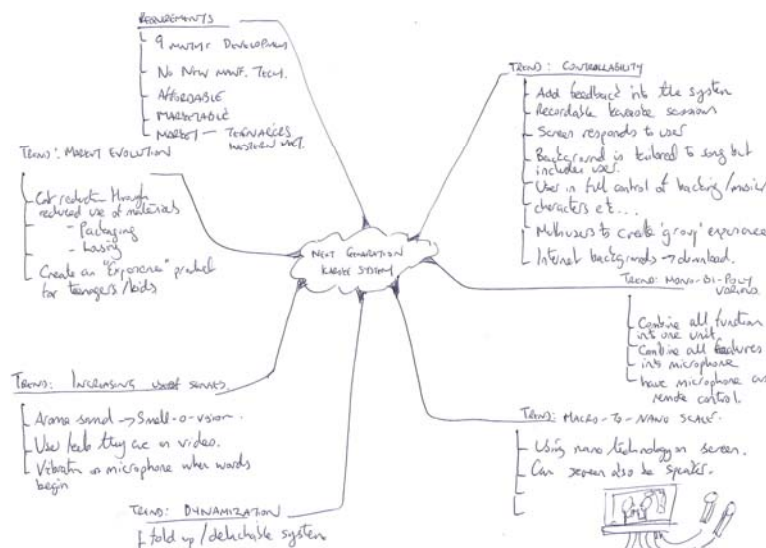
Principle 15 prompted the team to start thinking about adaptive and split screens to increase the functionality while reducing the complexity of operation.

In parallel to this activity the project team also used the evolutionary potential tool to establish how the existing home karaoke systems might evolve.



**Figure 5: Evolutionary Potential Plot of the Current DVD System**

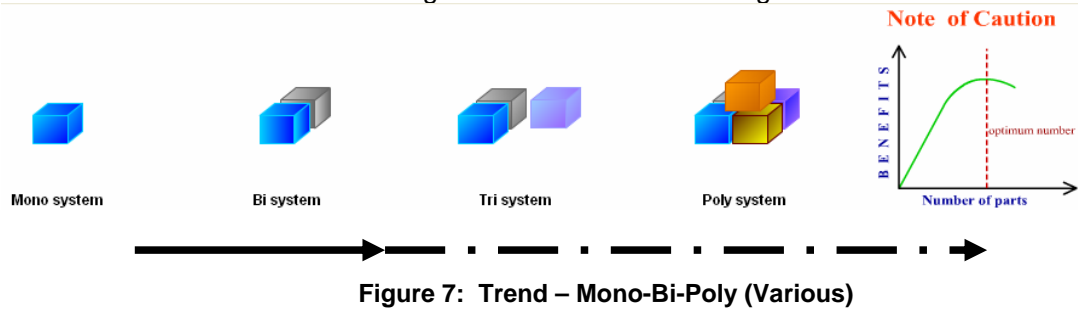
Figure 5 illustrates the evolutionary potential plot produced by the team. It suggests that there is a great deal of untapped potential in the current product.



**Figure 6: Mind Map of the Solution Generation Phase**



Figure 6 illustrates some of the ideas generated as the evolutionary potential plot was being constructed. The best ideas were generated from the following trends:

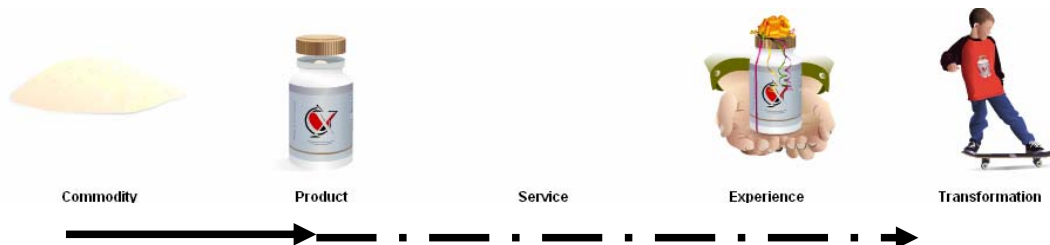


The Mono-Bi-Poly trend suggests that products and systems evolve by integrating different complimentary objects/products until the product reaches its optimum number of parts.

This therefore suggested to the team that they should consider having a single device that combined a number of functions/features into one unit.

One solution the team considered was integrating a television display, speakers and DVD player into one unit reducing the setup time and complexity of operation. As a result, the product would be far better suited to the target buyers.

The major breakthrough of the activity came when the team used the trend to integrate both the microphone and remote control of the system into one component, significantly reducing the total number of components required to operate the system, as well as reducing the manufacture costs and improving usability.



The market evolution trend suggests that products evolve to services, then experiences and finally transformations. In the context of the Karaoke player this has obvious connections. If the Karaoke device can provide an “Experience” for the user it is possible to increase its perceived value.

The team investigated various routes to increase the “experience” of using the product. Among the many ideas generated a solution that incorporated a simple webcam into the unit was developed. The webcam feature would allow the user to see themselves performing. To heighten the experience a number of options were considered, such as having a variety of backgrounds using simple software solutions that can be selected by the user and applied to the screen.

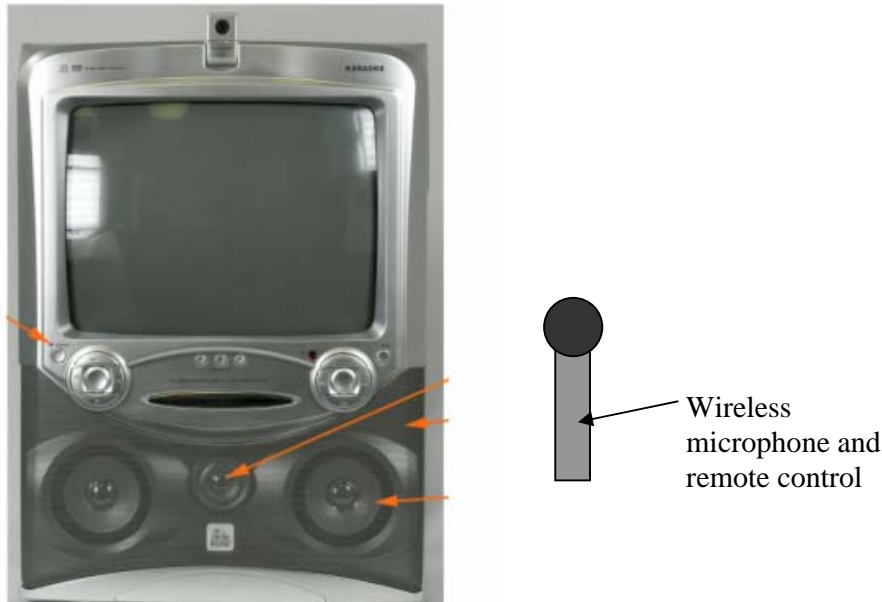
Possible future developments of the system were also identified as a result of the TRIZ sessions. These included:

- The webcam function also brings the future possibility of having remote Karaoke sessions with friends over the internet to further increase the user experience.

- Additional technologies were identified for future development where the screen could also act as the speaker, enhancing aesthetics and decreasing the complexity of the device. This technology is currently commercially available and has the potential to reduce the overall size of the device significantly.

### 3.2.4 Solution Description

The solution developed was the “web-cam enabled karaoke system”. The system consists of a single unit integrating the speakers, the display, the DVD player and the webcam. With the system comes a master microphone that also acts as a remote control to change tracks and volume. An embodiment of the system is described below:



**Figure 9: Illustration of product**

Figure 9 illustrates the developed solution. The final solution is felt to be ideally suited to young people, having multiple functions (TV, DVD and enhanced Karaoke) and being always setup for use requires no additional storage space.

The Karaoke system uses existing technologies available in the company. It was expected to be developed and in the market within the given nine month period and it was believed that the TRIZ activity had successfully assisted in proposing a completely new, higher value added product.

This product concept was recently introduced to one of the largest hypermarket customers in the US. The company has agreed to place an initial order for this product amounting to US\$ 3 million. The Karaoke system went to mass production in November 2005.

## 4.0 Conclusions And Next Steps

From the pilot company's feedback and the case study results the combination of intensive taught and hands-on problem solving facilitation workshops was an effective way of transferring the TRIZ method to the companies enrolled on the programme.

It was reported by all the participating companies that they increased their awareness of Intellectual Property significantly in the nine month period. They were able to understand

patents better, had increased awareness of infringement issues, were able to better draft preliminary claims and use TRIZ to better protect their innovative ideas.

A number of general observations were made throughout the programme. In terms of the training, it was reported that this amount of training was too much for the average Hong Kong based SME. The majority of the companies involved reported difficulties in attending all the training and hands-on sessions. This was attributed to SMEs typically operating in rapidly changing market conditions with limited technical and financial resources. Releasing their teams from their normal daily operations for all six of the training and problem solving sessions was problematic.

Observations, specifically of the TRIZ method, were that the Hong Kong and China companies preferred to use a small number of the TRIZ tools introduced. They concentrated their efforts learning and applying these preferred tools. This is contrary to European and US experience, where in the past a wider range of problem solving tools have tended to be taught. It was observed that all of the innovative solutions developed by the participating companies were through the application of these preferred TRIZ tools

The preferred tools used by the Hong Kong companies to generate the majority of their solutions were:

- Problem Pack
- Functional analysis
- Contradictions
- Trends of evolution and evolutionary potential
- Knowledge/Effects

A Hong Kong specific method has been proposed as part of this programme that builds on this observation. The Hong Kong specific method proposes the introduction of fewer tools, increasing the learning time and decreasing complexity without impacting heavily on the overall effectiveness of the method to generate innovative solutions.

For the future training sessions in Hong Kong it is believed that the streamlined method could be effectively taught in two separately run two-day sessions with at least two of these days working on company specific projects. It is recommended that there is at least one month between the sessions to allow sufficient time for the company specific problems to be worked on.

For the future of TRIZ in Hong Kong, translation of the TRIZ resources used during the programme into Chinese is currently underway. Furthermore, translation of the TRIZ Companion book [6] is also underway to make it easier for Chinese speaking companies to learn and apply the method. Both software tools and books are expected to be available in early 2006.

## **CD-Rom**

Copies of the CD-Rom output of the programme are available to Hong Kong companies at a price of 50HKD from [cctang@hkpc.org](mailto:cctang@hkpc.org). Interested parties outside Hong Kong (SAR) may obtain copies through the [www.systematic-innovation.com](http://www.systematic-innovation.com) website.

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