

THE RE-ENGINEER

Towards Technological Development in Sri Lanka



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Young Business Technology & Entrepreneurial Researchers
(YBTER)

The Re-engineer
Towards Technological Development in Sri Lanka



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Acknowledgements

This is yet another pioneering attempt by the Students Association of Business and Technology (ABT) of Department of Commerce and Financial Management to organize its annual undergraduate congress for the 3rd consecutive time. It was a tough challenge for us hence we had to face enormous challenges on the way through. Yet we were able to surpass all those confrontations with the ones who helped us. At this moment as a gratitude to them, we would like to remind them since without them we won't be able to do such thing.

So, our special honor goes to Dr. D.M. Semasinghe, the Dean of the Faculty of Commerce and Management Studies and Dr. C. Pathirawasam and Head of the Department of Commerce and Financial Management for always encouraging us. Also our sincere gratitude goes to the all the lecturers at the Department of Commerce and Financial Management for the invaluable support given. Further we would like to remind our valuable sponsors; Access International Pvt Ltd, Association of Accounting Technicians (AAT) Sri Lanka, My Computer Pvt Ltd and CEAT Kelani International Tyre Pvt Ltd for extending their financial support to make this endeavor a reality. Last but not the least we are thankful to all the undergraduates who actively participated for the event and for their contributions, commitment and enthusiasm to make YBTER Congress 2014 a success.

YBTER 2014 Organizing Committee

Message from Dean



It gives me an immense pleasure to convey this felicitation message as the Dean of the Faculty to the YBTER Congress 2014 organized by the Students Association of Business and Technology (ABT) of Department of Commerce and Financial Management (DCFM). It is a richly deserved honor to greet them as they will celebrate fruitful 3rd consecutive year of YBTER. As always, this time ABT is heading the congress with an innovative theme named “The Re-engineer: Towards Technological Development in Sri Lanka”, as ABT is renowned for novel endeavors and in fact the theme is more appealing for Sri Lankan context.

It is not a surprise that third world countries like Sri Lanka is always lagging behind the technological developments and still being ruled under Technology Dependency Theory. I believe and it is heartening to say that this initiative may have a constructive impact on such annoying dependencies in our path way to be a self-sustaining country. More than that, since this is an undergraduate endeavor, the concept YBTER may certainly open up new avenues on contemporary topics such as Outcome Based Learning, Student Centric Learning that are apparently being talked about these days in Sri Lanka.. I really extend my appreciation for carrying out such novel initiative with meticulous attention. I take this opportunity to wish all the success for this congress and its organizing committee and highly appreciate the effort made by the staff and students to make this event a success.

Dr. D.M. Semasinghe

Dean, Faculty of Commerce and Management Studies

Message from Head



It is indeed an honor as the Head of the DCFM to convey my warm congratulation to the YBTER Congress 2014 at this occasion of its 3rd consecutive celebration upon the theme “The Re-Engineer: Technological Development in Sri Lanka”. Most importantly, it is my proud privilege to mention that this honor goes to the Students Association of Business and Technology (ABT) of Department of Commerce and Financial Management (DCFM) as organizers of this event.

The world today needs people, especially young generation of exceptional caliber with brilliant minds. The concept by YBTER, I believe opening up new avenues on innovative open-minded learning, will pave the way towards much needed graduates fully fledged with skills required to attending the issues confronted by public. Over the decades, Sri Lanka has been lagging behind in adapting and adopting breakthrough in technological developments as the civil war pulled its momentum backward. Hence as a country we need to overcome technological dependency from wealth nations. I highly appreciate this effort as it develops intellectual capabilities and unique skills that can shape our future minds.

I look forward to your continued participation in the process of novel initiatives and I’m delighted to extend my appreciation for the effort made by the staff and students to make this event a success.

Dr. C. Pathirawasam

Head, Department of Commerce and Financial Management

Table of Content

Acknowledgement-----iii

Message from Dean-----iv

Message from Head-----v

PROLOGUE:

Leading the Way to Technological Development in Sri Lanka:

The Re-engineer-----1-9

RE-ENGINEERED PRODUCTS

01. PheliaPlus - Smart Desktop Manager-----10-15

02. Refresh on the Way (ROW) – Re-engineered Tea/Coffee Bags-----16-21

03. Multi Pin Socket with Power USB-----22-28

04. Smart Umbrella-----29-36

05. GLACE Mini Car Cooler-----37-44

06. PureDrop – Mini Filter-----45-50

07. Maru Roti-----51-56

08. CHENA – Evaporative Air Conditioner-----57-65

IDEA EXTENSIONS

09. Handy Ruler-----66-69

10. Smart Tag Detector Counters-----70-71

11. Laptop Table-----72-77

12. Tiptop Tippex Pen-----78-79

PROLOGUE

Leading the Way to Technological Development in Sri Lanka: The Re-Engineer

C.N. Wickramasinghe¹

Technology and Modern Life style

Complexity of day to-day life of a common man in modern world has serious connection with technology and new product development. People in modern societies are eagerly waiting for “Next big thing” in the market. As technology is growing rapidly in every industry, complexities of the modern life style and expectation of people have created endless business opportunities for innovative businesses. As there is huge competition among companies, they have to involve in research and development projects seriously to be recognized as the pioneer of “next big thing” in the market. Hence, sometimes technologies come far too rapidly before the need of such technology. Further, the recent development of digital technologies has provided endless possibilities to develop new products and services that go beyond the existing customer requirements; it actually creating new life styles among the customers. Therefore, new product and service development is become the life changer, while it is become a critical factor to satisfy the needs of modern society. This people, technology and business triangulation create a new paradigm in modern business environment.

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Technology helps people to keep in touch with people who are away from them. They use the telephones and computers to talk to them and even see them. Daily office work is also technology based. No longer do people use the pen and paper to complete their work. People maintain their health by going to the gyms. There are machines in the gym which help people reduce their weight and keep fit. Hence, the use of technology has made life easy. One cannot think of a life without technology. People use to keep a lot of information in a small device and use it when they like. Cars have also become better with the use of technology. Hence, technology is unquestionably an important part of modern life.

What is Technology and how it became a Business industry?

Technology is known by everyone, but actually majority of them do not really understand the meaning of it. Even though the term ‘Technology’ become the most important term in business vocabulary, even in business management the term “Technology” is heavily used to explain the technologies use to handle information; However this is serious misconception, where the technology is much broader than information technology.

Technology is generally defined as the application of scientific knowledge for practical purposes. During the first industrial revolution (1770-1820) majority of the innovations developed without having sound scientific and theoretical explanations. They were fundamentally based on imaginations and hypothesis of creative individual. It created innovations without having scientific knowledge to explain the functionality of the machinery and

mechanisms in the industry (Mokyr, 1992). However, since the second industrial revolution (1870-1914) started in US, majority of the industrial product innovations were developed based on scientific experiments, principles and theories. Therefore, functionality of most of the technological products has been able to justify through continuous scientific experiments. Utilization of scientific method in innovations has paved the path for Research and Development to be recognized as integral part of business organization. When the R&D becomes important aspect of the technology development, new product development process needed to be more systematic than garage innovations. This has required higher investment and larger organization. This change had made the technological innovation as a restricted business activity only viable for large organizations.



Inventions are interconnected. Source: (Ryan, 2012)

Owing to the establishment of stronger legal protection on intellectual property rights, technological inventions have been the dominant economic activity in 1870s. Further, unlike the inventions in first industrial revolution, majority of inventions invented during the Second Industrial Revolution were

interconnected. Interconnection means one invention pave the way to another invention based on or used by earlier invention. The railroad spurred the growth of the telegraph machine. Telegraph lines and railroad lines inextricably bound together as telegraph polls dotted the distance of railroad lines (Ryan, 2012). Therefore large number of inventors tried to invent competing inventions and this change has created battle between inventors and business organizations

Famous example of this competition was invention battle between Thomas Edison and Nichola Tesla. While Edison invented the bulb that uses Direct Current (DC), Tesla invented the Altering Current (AC) fluorescent bulb. They were openly criticized one–another over their inventions and accused each other one stolen other’s idea and so on. The competition between Edison and Tesla is one of the famous invention battles in the history and still there are number of arguments over who was the best among them. Likewise there were many near and related inventions that make invention as competitive business industry, which make rivalry between companies on their innovations. Including tesla Vs. Edison, there were many battles between companies and inventors on their technological innovations (Colvin, 2013). However, majority of such battles taken place people and companies established in industrial countries. Fruits of second technology revolution were not transferred to some parts of



the world like Asian countries like Sri Lanka. Lately this segregation has become most decisive separation of the world as third world countries.

Technological Dependency of the Third World

Impact of technological revolution has not been equally spread around the world. Actually the level of absorption of technological development has created significant segregation between countries. The countries those who dominated in first and second industrial revolutions have been establish as developed/industrial countries. They were the ones who heavily invest money on R&D to make breakthrough innovation that create new local and foreign markets. Countries those who missed the opportunities created by second industrial revolution have been recognized as third world countries and they become the good market place for technological innovations developed by industrial countries (Ferraro, 2008). Rather than encouraging third world countries to engage in technological development, this limitation has been theorized by the World Bank as Technological Dependency theory where third world countries should not try to innovate any technological product as they do not have relative advantage on it. While industrial countries were engage in technological development, third world countries were expected to supply raw materials for industrial countries and involved in agriculture. Sri Lanka is one of such the third world countries who missed the opportunities to move with the technological development. Currently Sri Lanka is falling behind in technology development to the some of the neighbor countries those who had lower socio-economic status than Sri Lanka three decades ago. Recent developments of new harbors, airports, highways and other infrastructure in Sri Lanka seems to be the process of

catching up the missed opportunities to attract more foreign investment to transfer technological knowledge from industrial and specially newly industrialized countries lead by China and India. However, owing to technological tumble, so far Sri Lanka has not been a famous destination for Foreign Direct Investments (FDI) and recent transfers of technological production from industrial countries to third world countries.

Re-Engineering as a Strategy in Digital Era; How China and India Catch Up?

Since the year 2000, Internet and other digital communication technologies have grown rapidly than ever before. Even it not recognized yet, things are happening at revolutionary rate. Unlike the second technological revolution, this digital revolution is more symmetric and participants include the third world countries as well. Digital revolution provides multiple modes to access to the Internet, where the 90% of the technological knowledge been stored. Even the giant countries like China and India started their technological development by Reverse-Engineering the technological product developed by industrial countries (Dhalman, 2007). Hence, third world countries those who have the thirst of catching up with technological development effectively utilize the Internet as mode of technological knowledge transfer.

Reverse-Engineering is a process of reproduction of another manufacturer's product following detailed examination of its construction or composition. Even though it is kind of a violation of intellectual property rights, reverse engineering has been the best approach to transfer technological 'know-how' from industrial to third world countries. Reverse-Engineering process allows countries like China and India to develop technologies at lower cost and

specially to meet the local requirements. As there are number of third world countries those who have similar needs, this reverse-engineering products have created opportunity for China and India to enter low end of the world market. Then during last decade with the Know-How knowledge gain through reverse engineering, China and India have move towards Re-Engineering that developed value added product based on the product available in the market.

New Perspective of Re-Engineering

Re-Engineering generally defines as a process of fundamental rethinking and radical redesign of process to achieve dramatic improvements in critical measures of performance such as cost, service, and speed (Hammer & Champy, 1993). Even though, the concept was introduced to redesign the processes, modern business environment can utilize the concept to develop value added reverse engineering technological products.

Often existing products need to be re-developed to improve their performance, modify their functions for better stability. Re-engineering of product can be defined as change of utility and performance of existing product through reverse-engineering.



Unlike pure reverse engineering, re-engineering include local innovative step in the new product. Further, As there is inventive part in the product, unlike reverse engineering, re-engineering have higher risk that should be absorb by the risk taking and creative people in third world countries. Its process of changing the business

towards new product development through re-engineering to gain the benefits of emerged opportunities in the technology field.

According intellectual property law established by the industrial countries, when the producer of the inventive product gets the monopoly through intellectual property protection, they can charge premium price from the customers. Hence, definitely there is need for low cost edition of the new product that suite for the demand of people in third world countries. Through re-engineering innovative people can add new features to improve the functionality and efficiency of the existing product or develop product that can be utilize to get totally different utility in third world countries. As the technology adapted in existing product clearly stated as the 'prior art', due recognition can be given to original inventor, while re-engineer can claim his rights for inventive step. As the new product is re-engineered based on existing product, this strategy would allow innovative people and business organizations in third world to be engaged in innovative product development without investing huge investment R & D to get know the science of the product.

Preliminaries to be made to Raise Sri Lanka as Next Technological Destination

Sri Lanka is late, but still not too late to catch up the technological development through re-engineering. Hence, it's the right time to identify technology as integral aspect of business and re-engineering as a strategy in new product development. If otherwise, all the infrastructure development taking place in the country would be vain and Sri Lanka will sink in much deeper place in technological dependency.

Continuous Innovation is the best approach to enter to the modern business world; however, current technological mindset not encourages taking higher risk in investing money in R&D activities. Compared to other emerging countries, Sri Lankan investment in R&D activities is poor. Technological dependency has been rooted from the core of business organization and openness to innovation is remarkably lower to take leap frogging development. It's just a matter of effective utilization of the existing knowledge to develop localized products that satisfy the local demand. Therefore, it is important to change the mind set of private sector towards re-engineering and invest in R&D.

To achieve the expected results, it is important to educate the existing business managers, future managers, entrepreneurs and employees about the importance of reverse thinking and innovations. Education system, especially university education needs to address this matter seriously. Especially the Business and Commerce undergraduates should be thought technological aspect of business and at least basic skills in innovation through re-engineering. Even though, formal lecturing is not the best way to teach the re-engineering and innovations, with the experiences of reality shows, social media and other communicating technologies, knowledge can be transferred to students with innovative ways. YBTER 2014 is the first attempt to enhance the re-engineering skills among business and commerce undergraduate to make them as "Business Engineers" those who will become future managers to take Sri Lanka towards technology development by making their organizations more innovative.

PheliaPlus - Smart Desktop Manager

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The Problem

Modern education system have made the students are more competitive. Not only in school education, university education has also become more competitive and demanding more qualifications. Hence, students are used to study long hours on various courses and exams. This competitive study system has made the study desk more and more complex. Students need to keep different study materials on their study table, specially their laptop or desktop computer and as they are working long hours, of course the table

lamp. More than that, radio system to listen music have become a common things on students' table. This has made modern day study table look messy and complex place. This make



students to work hard on gaining concentration. According to the scientific research findings “Multiple stimuli present in the visual field at the same time compete for neural representation by mutually suppressing their evoked

activity throughout visual cortex, providing a neural correlate for the limited processing capacity of the visual system” (Donalds, 2011). Findings says that when there are many objects within visual area, it become an obstacle gain the total focus and concentration on information. Hence when the students have more objects on the study table it negatively effects on their concentration and focus. However, students were unable to remove the items such as table lamp, desktop clock, speakers and even small table fans since those are an integral parts of the messy study tables. Therefore, it is necessary to find a solution to provide all the study table requirements in a single product that reduce the mess on the study table, thus to improve their students’ performance.

Avoid the Heat by Desktop Coolers

Sri Lanka is a tropical country with 28-32 °C average temperature. It is quite hot and some month’s temperature goes beyond 33 °C. Hence, air-cooler is desperate need in countries like Sri Lanka.

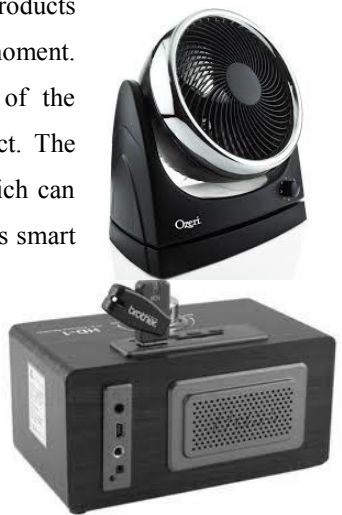
There are compact versions of desktop coolers and air conditioners in the market. Even though there are imported products available in the market, the cost of the machines and energy usage still at higher side for common men in Sri Lanka. During the hot summer these desktop fan can give freshness to study well, but meantime it will add another item to the desk while increasing the electricity bill. Therefore value added Desktop Manager with Cooling Fan is the most viable solution to air-conditioning. Hence, there was a potential to develop



more efficient evaporative cooler that can give more value added features afford by middle class students in Sri Lanka. 3 in 1 Desktop friend is the minimum viable product as such.

What Is Desktop Manager?

Desktop manager is one of the most essential products to the market which was not available at the moment. The specialty of this product is that most of the desktop functions are available in one product. The product facilitates more than one function which can be used for multi purposes. Desktop manager is smart equipment which is functioning as MP3 player, air cooler, clock and the lamp. Considering about the concept, it is really important to analyze the potential market of the product. Many technology start-ups



failed because they focused more on their product than on their potential customers. Therefore desktop manager mainly focuses its customers as the young crowd and students since this will be a valuable product for every students. The product clusters important needful desktop functions in to one single



product. It will help to keep the desktop more neatly and it saves the space. And with its small design it can be easily moved from one place to another. It does make a



sense of portable equipment. The technology of this product is very simple. This desktop manger directly powered through electricity and also this can be used without electricity with its rechargeable batteries. Since the desktop manager a collection of several products, will more worth to the customer. So this product will helpful for the customers to fulfill their needs easily with its simple design suited for a small space.

Prior Arts of the Smart Desktop Manager

There are lots of cooling fans together with the light available in the market. These products are made by china using different technologies. There are different sizes and designable product.

- Portable Multifunction
Torch with FM Radio rechargeable Fanlight with Radio
- SOLAR FAN of ARDSCX168D with light
- LE1618-6BL LED rechargeable 8' fan with lights.

The above products can be identified as the near products. As mentioned above, there are lots of features and advance technology involved in these products. Hence it takes high cost to produce a product with all these features and technologies. Because of that, it cannot be purchased by middle and low income level people. Besides most of those products are not available in Sri Lankan market and if available, its average cost will above Rs.3500/= excluding the delivery charges.

Objective of the Desktop Manager

The Desktop Manager consists of a Cooler, MP3 Player with Radio, Digital Clock and LED Lights. So it helps to perform multi tasks at a same time. When these products take separately it takes more space on the table. But Desktop Manager reduces the space and at the same time helps to provide more utility. Though there are products such as MP3 players, portable coolers and lamp shades as separate products, there is no product available in the market with all these features together embedded within a single device. Attractive finishing, multi-tasking and portability will enhance the customer value addition as well as reasonable price also will increase the customer perceived demand.

- To offer a product with multi tasks (air cooler, mp3 and led lights) at an affordable price.
- To offer a Desktop Manager that can carry it anywhere (portable).
- To provide a Desktop Manager which is attractive and makes the work convenient.

Product Features

- The Portable Desktop manager is small in size and reduces space on the study table.
- Included an air condition fan which gives cool air.
- Included rechargeable batteries.
- An Mp3 player is available and gives best sound quality.
- Everyone can carry it anywhere (portable) because it is light weighed.
- LED bulbs are available, so that can use it as a lamp shade.

How Smart Desktop Manager Works

We introduced portable air conditioner with MP3 player and LED touch bulbs. Fan of the Smart Desktop Manager works with 230V, hence it gives more cooling power than 5V coolers. To convert the AC to DC, AC to DC power adapter was used as the main power source. The power directly comes to AC to 5V DC converter. Then this 5V DC will directed to charge the two rechargeable batteries, which are giving power to MP3 Player and LED Bulbs.

The significance of this system is, in case of a power failure, system will automatically uses battery power to run MP3 player and LED lights. To generate battery power we have used two 5V Rechargeable batteries and those batteries keeps charge, the main supply switch is ON as a backup source. Moreover the batteries are kept under a specialist case in order to protect them electrically shocks and physical arrangements.

The entire system has introduced a plastic box in order to prevent customer from electrically shock. We have attached cooling fan in our product as the main feature. AC power gives directly to it and also it has attached to AC power adaptor through AC cable. Then AC cable and AC power adaptor, both has attached in AC socket with the purpose of given power supply through one power cable.

MP3 Player and speakers are also attached to the plastic box. And also we have attached to LED bulbs to use at night as a table lamp and given 6V power through the main power supply or rechargeable battery power.

Refresh on the Way (ROW) – Re-engineered Tea/Coffee Bags

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Madhusanka I.P.M.

Tea is one of the strongest blood line in Sri Lankan economy. Sri Lankan tea products were the best of world in the past as we had no significant competitors in the international market. But the current situation is completely different since there are many quality competitors around the global and as a result we have to win over to secure our share of business. Meanwhile it is encouraging that world tea consumption have been increased remarkably in last few years (The English Tea Store Blog, 2012). More and more consumers are getting used to consumption of tea. Therefore, there is necessity to introduced value added tea products to the market rather than exporting bulk tea as raw tea for value added production. Tea bags have been one of the famous value added version of tea. Both multinational and local companies introduce value added tea bags with different flavors.



Hence the competition in tea bag market has increase the need of improvisation in tea bags. Since the competitive nature of the business, each and every tea/coffee companies in local market are trying to catch the market by changing and improving the color, flavor, quality, packaging and etc. However attention was not given to change the tea bags in order to give more convenience to the customer. Since there are number of explicit limitations in traditional tea bags, yet there is opportunity to introduced new design for tea bag to give extra convenience to the customer.

The Problem

The invention of the tea bag is said to have resulted from the small silk bags sent out to potential customers in 1908 by Thomas Sullivan, a New York



City tea importer. Since then, the use of tea bags has grown substantially. However, tea bags were unable to provide the intended convenience to the customers. The main advantages of using tea bags instead of tea leaf are ease of use and disposability. However, the need of spoon, sugar or cups was not eliminated when making a cup of tea using the tea bags. Further, when there is no spoon available, it is difficult to mix the tea with water for exact taste. Hence, ease of use functionality of



existing tea bags is limited and there are innovative attempts that have been taken to overcome this limitation. Some solutions are add-on products for existing tea bags, some are new tea bag designs and others are new cup designs that minimize the limitations of traditional tea bags.



However the exiting modifications for tea bag and its usage are more complex and costly alternatives. Most of them ignored the take away capability as expected feature of a tea bag. The main objective of the tea bag is providing takeaway tea for the customer. Therefore, when designing an innovative alternative to traditional tea bags, it should provide takeaway tea at minimum cost. How to provide those two utilities at the same time was the challenge of this product design.

What Is “ROW”?

Design team identified three basic modifications of traditional tea bags to be done to make it more take away friendly. Those are:

1. Users shouldn't need to carry a spoon and sugar with them.
2. Users shouldn't carry cups to serve tea.
3. After drinking, everything should be able to dispose easily.
4. The price of one tea cup should not exceed the current market price of a tea.

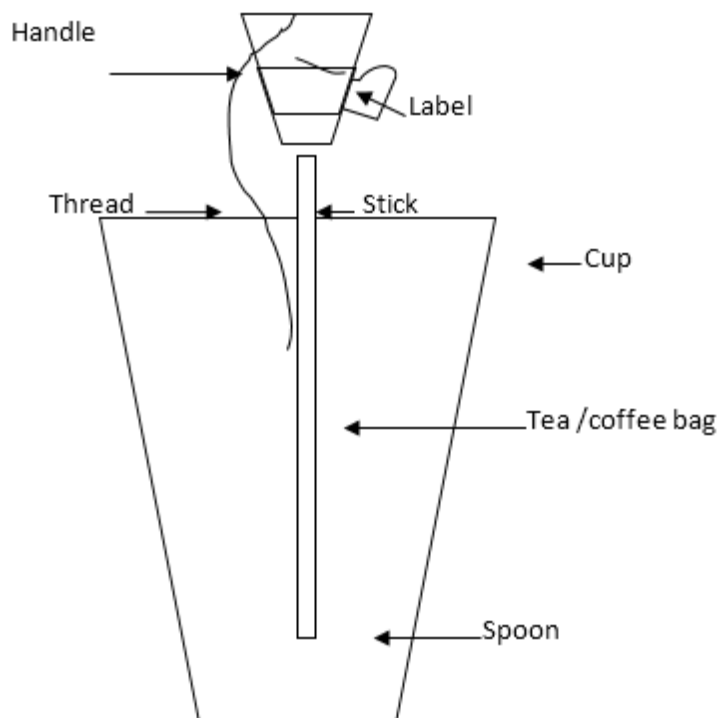
In order to achieve these requirements, ROW conceptually redesigned the tea bag. As there are no machines available, ROW is handmade tea bag attached to plastic spoon as umbrella shape. There is a tread attached to the tea bag to take the tea bag out from the cup after the desired taste is achieved. Spoon will allow users to mix the tea with sugar or milk (not provided).

Secondly ROW introduced disposable cups with sugar packets as added features to the tea bags targeting takeaway tea users such as travelers. With ROW, customers only need to find cup of hot water to make their own tea without having any trouble.

ROW- Coffee

Tea bags was there since 1908, however coffee bags were not become famous in the market. There are few products available in the market but especially in Sri Lanka, hardly seen any coffee bags available in the market. Therefore same product concept was extended to make coffee bags that would capture the attention of coffee lovers.

Product Design



Main feature of the ROW design is, the shape of tea bag has differentiated into umbrella shape to build up a unique product. “ROW” only uses a thread to tie the tea bag to the plastic spoon stick. The stapler pin used in normal tea bag is removed in designing this product to make it more consumer health friendly. Users can use the handle to mix up tea with sugar and also the thread is there to bring up the tea packet up to the spoon when hot water absorbs tea flavor according to the taste of user.

Potential Market for “Row”

- Working people (office use)
People with busy schedule do not have a single minute to waste on even to have a cup of tea/coffee hence we are the mainly targeting such market.
- Outdoor parties
Outdoor or instant parties are potential targeted market.
- Health conscious people
Basically the focus is middle age and old people who are more concern on sugar levels and cleanness.
- Travelers

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Multi Pin Socket with Power-USB

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Introduction

Universal Serial Bus (USB) is one of the latest data interfaces that allows connecting number of peripheral devices to computer system. Powered-USB provides a single cable connection that supplies both the standard USB communication signals and two additional wire pairs for extra power (PoweredUSB, 2013). Since the USB port can provide 5V power with 500 mA, it has become a mode of power generation for small electronic devices. USB has drastically evolved from a data interface capable of supplying limited power to a primary provider of power with a data interface. Today many devices are charged or get their power from USB ports contained in laptops, cars, aircraft or even wall sockets. USB has become a ubiquitous power socket for many small devices such as cell phones, MP3 players and other hand-held devices. Further for some of the electronic devices that use traditional AC to DC power reduction has been switched to USB power which required high voltage that is 5 Volts. One of the limitations of standard USB is the amount of +5V current available to supply attached peripherals. Normally, 500mA is available at each host port and each powered external hub port. This amount of current is sufficient for most PC type peripherals

like mice and keyboards (PoweredUSB, 2013). Even though the power consumption changes, most of the devices coming with USB ports that require AC to USB power supply device.

The Problem

With the development of the technology, more accessories are now coming with USB port. However, there are two main limitations of existing powered-USB. First, different devices are coming with different power requirements and Second, Laptops and other computer devices are unable to use their battery power to give power to many USB devices at once. As an example mobile phones, tabs, iPods, iPhone, GPS devices, MP3 players and Digital



camera coming with USB port, but they require different power levels and also Laptop cannot provide continuous power to these devices as its battery power is limited. Hence, people have to use separate USB chargers to get continuous power for their USB-powered devices. There are number of AC to USB power adapters in the market.

The Solution

People usually use multi pin plug or wall socket plug to get power for various accessories and equipment. However, there is hardly any multi-socket plug with power-USB port to plugging those USB powered accessories. Yet, the multi-socket adapters available in the market have enough physical space to provide USB port as a value added option. Therefore that is the opportunity adapted to make the multi-functional power adapter in order to provide USB



power from same multi-plug. As majority of the USB powered products uses 5V with 500mA, initial product is designed to provide Power-USB with 5V. However, the concept can be extended to provide multiple USB sockets with different voltages to give power to other products, which need higher power than standard USB power. With this re-engineered product, customers do not need to buy multi-socket plug and USB charger separately, they can use USB powered multi-socket as one device to get power for all their electronic devices.



The product is styled to provide a contemporary power unit for the home, office or work space. The basic idea of the plug is a small unit with multi socket and female USB port inside it. There are two version of the product.

1. **Wall Plug Version:** It's an extended version of wall plug with USB port to provide standard 5V power to USB devices and
2. **Multi-Pin Socket Version:** It's an extended version of traditional multi-pin socket to give standard 5V power to USB devices. The product is shaped in a certain way so that it can be carry around easily by the user.

Product Design and Development

Proof of concept of the product was designed using the materials available in the market. In order to develop the product there were certain materials to be supplied. The main components of the products can be easily found in the electronic markets at different costs. Depending on the quality requirements and pricing strategies one can select the materials from the market.

List of Materials Needed

Multi Plug Sockets,



Female USB Port,



A/C to D/C Converter Module



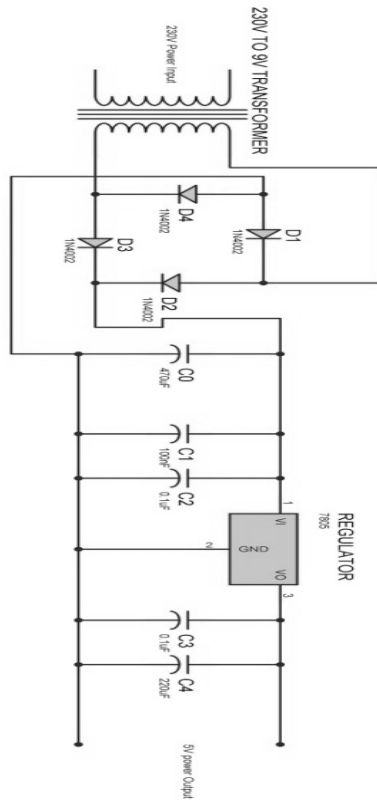
Wires and Related Accessories



AC to DC Power Converter Module

The main consideration of using Powered-USB in multi-pin socket is reducing the 230V AC power to 5V DC Power. Every USB charger is built in AC to 5V DC converter module inside. In this innovation, pre-assembled AC to 5V DC converter module is used as it is often available in the electronic market. However, this section is going to explain the mechanism of making rectifier circuit to convert 230V AC (power supply into 5V DC power supply).

Following figure shows the circuit diagram of AC to 5V DC power converter.



Moving from left to right of the circuit, 230V AC power needs to be supplied to 9V converting transformer (Rathnayake, 2012). Then this 9V power needs to go through four IN4002 diode rectifier bridge. Bridge Rectifier is taking the AC voltage from the wall and converts it to DC voltage. This circuit also takes the 60 Hz signal from the AC source and passes it along to the DC

output. It then drops the voltage down to 5V via a 7805 voltage regulator. Regulators are designed to supply required voltage without fluctuations which means we do not need to use regulators with DC power supply. The resulting output will be a 5V DC signal pulsing 60 times a second. It is important to know how to select a regulator from the market for this type of project. Depend on the output voltage requirements normally last digits of the regulator indicate the output voltage. Eg: 7805: 5V, 7806: 6V, 7809: 9V. Regulators are with wide range of voltages available in the market. Then we need to assemble those things which explain in the above. Finally regulated 5V output have to be connected to the female USB port, which will add the power-USB interface to the multi-pin socket.

Challenges

The main challenge of designing this product is finding smaller AC to DC converter that can be fit inside the available multi-pin socket. After finding the multi-pin socket that can occupy the AC to DC converter, female USB port was fixed by removing one two way power pin from the adapter. Same AC to DC adapter was used in the wall mount socket too.

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Smart Umbrella

Darshani P.K.C., Madushani P.K.N., Ruwantha A.S.N., Mallika M.C.K.H.,
Gunathilaka S.P.M., Gunarathna D.K.

Introduction

Today's market is a turbulent and demand driven market in which customers are highly demanding for SMART products and services. In fact buyers expect more than one benefit or single feature from a commodity. Sellers also try provide the commodity with more than one benefit to the customers. These two parties gather in the Smart Market and we can call them as Smart Buyer and Smart Seller. Umbrella is a kind of a product we normally use in day today life to protect from sun burn or avoid getting wet during the rain. Potential market for Smart Umbrella is the market where buyers expect more than single benefit from a traditional umbrella which only used for above mentioned activities. Hence to get the attention in the Smart Market, we should have be a Smart Seller. Smart Umbrella is such an innovative product that we are offering to the Smart Market.

The Problem

Umbrella is a necessary tool for our day today life. As a tropical country, Sri Lanka have relatively hot sun in most of the days in a year and heavy monsoon rains which indeed makes umbrella as an unavoidable tool among each and every person. Apart from the utility, it has become fashionable tool for many young females. As a result of such usage nowadays we can see various umbrellas with different colors, shapes and etc. created to attract the

customers. But it is questionable the value addition of such umbrellas. Though most of the companies did the above mentioned changes, no one thought about the fundamental value addition alterations that can be applied to the umbrella. Especially when rainy night most of the people have to carry torch to see their pathway. Besides when there is umbrella in one hand and something on the other hand (e.g. Hand bag), it is very difficult to take a torch to see the pathway. Moreover, there are many accidents happening on rainy nights as drivers were unable to see the pedestrians. Therefore safety wise, it is important to bring some kind of illuminating light equipped to the umbrella when walking in dark rainy nights. When travelling unknown territories travelers are always advised to bring an umbrella and torch. However, there is no any product available in Sri Lankan market that provides the utilities of an umbrella with illumination facility. The prime objective of this new product is to integrate the umbrella with illumination mechanism. Furthermore, the product idea is extended to introduce MP3 Player and a Time Watch targeting the leisure travelers. Hence the Product idea is to re-engineer the umbrella with new value added features, such as Torch, MP 3 player and Watch. As it provide many value added functions, it can be considered as actually a Smart Umbrella that gives multiple utilities that customers could not get from any competitive product available in Sri Lanka.

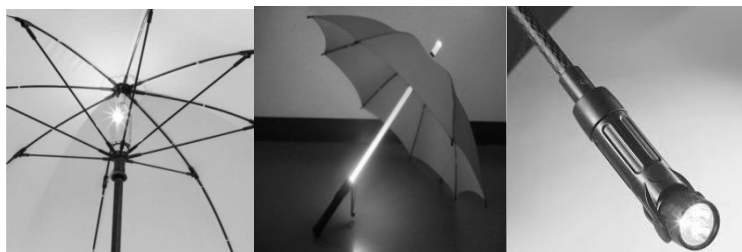


Smart Umbrella can be used by any kind of person who wants to use an umbrella. Especially Smart Umbrella has new features such as a torch, an mp3 player and a watch. Therefore especially youth can be attracted for

Smart Umbrella since youths are highly likely for new and fashionable things. It is expected that Smart Umbrella is a feasible and an innovative product for youth generation as well as for general public who like to experience a new product.

The Current State of Art for Near Products

Sri Lankan umbrella market is comprised with local manufacturers such as Kadurata, Rainco etc. These companies offer their products without any value added extra features. In other words they offer products to fulfill basic customer requirements cum making them more fashionable and stylish. Therefore this is a big opportunity to promote our product among all the customers in Sri Lanka. However, there are some similar products currently available in international market. But all of them have tried to provide Illumination function to umbrella. Smart Umbrella is designed to provide more functionality that can give more value addition to umbrella.



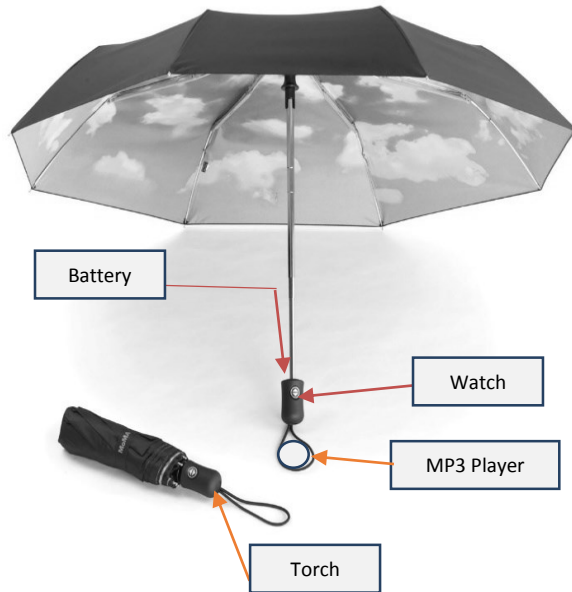
The Smart Umbrella

Current market has a huge competition related to the technology changes. Therefore all the manufacturer should adapt to the innovations and inventions to their businesses in order to sustain in long run, because current market has number of similar products. Therefore manufacturers all ways need to give value additions to their customers. The Smart Umbrella offers range of new features to the customers. Through this we hope to attract more and more customers for our product and successfully compete in the umbrella market thus exploring a potential niche market for umbrellas.

Objective of Our Product

- Provide an umbrella with multiple features such as torch, MP 3 player and watch.
- To provide an innovative and useful product for customers at an affordable price.
- To integrate different customer needs through the one product.
- To provide portable umbrella which is attractive and specified action.

Proof of Concept - Design



Main Features of the Smart Umbrella

- Smart Umbrella has a powerful LED light torch.
- Smart Umbrella has a MP 3 Player.
- Smart Umbrella has a Digital watch.
- All the devices are electrically powered through a rechargeable battery.



LED Light Torch

If you are going outside when a rainy night, normally you should bring two things. They are, an umbrella and a torch. But if you have a Smart Umbrella, you are lucky because torch is fixed in the umbrella. As a result it is very easy to handle.

The LED light torch provides 100 lumens of light which is enough to light up a walkway up to 30 feet ahead of you. It's powered by a 4.5 rechargeable battery that will provide for 48 hours of continuous usage (that's a long time to be out in the rain in a row).

MP3 Player

Today's trend is when someone going anywhere, they put hands free in their ears to listening songs. Smart Umbrella offers that benefit to you by including a MP3 player in the Umbrella. Mp3 player is in the handle of the umbrella as a Key tag. If you don't want to listen in music, you can take off hand free and you can walk the away with your Smart Umbrella.

Digital Watch

How convenient if you can see time while you are under an umbrella? If you have a Smart Umbrella, you can know the time because digital watch has been fixed in the handle of the umbrella and of course it is a waterproof watch. You can see time in the rainy night also since it has a LED light. Further if you want to change the battery, you should remove watch from handle of the umbrella.

The technology of this product is very simple. Smart Umbrella includes rechargeable battery for torch and when battery goes down; users can charge it by using their USB phone chargers. Digital watch includes a removable battery, and then customers can easily change the battery. So this product will be helpful for the customers to fulfill their various needs easily. Smart umbrella mainly focuses on young generation as well as people who like to experience a new product. Smart umbrella can be used especially in rainy nights unlike normal umbrella, because customers can use torch in the handle for darkness. In addition users can listen songs while they are going on the way. They can set their hands free to MP 3 player in the handle of the Smart umbrella and can listen the songs. Furthermore users can see the time from Smart umbrella. Therefore using this product customer can consume benefit more than a normal umbrella. All the people can use this product easily because we added new features which are not existing in an old fashioned umbrella and we believe Smart umbrella will be popular product to customers.

GLACE Mini Car Cooler

Caldera H.P.U.K., Chandrapala M.A.S.T., Chandrasekara K.P.K.S.M.,
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The Problem

According to some surveys conducted, people are often stuck in situations where they need to have cool drinks quickly while they are driving. Further, even they take cool drinks in the vehicle, it become hot after two-three hours. A customer survey has indicated that there is a need for an affordable mini cooling device for cars in Sri Lanka, because Sri Lanka is a tropical country with 28-32 °C average temperature. It is quite hot and in some months temperature goes beyond 33 °C. However, income level and fuel cost become hindrance for people to use regular vehicle bottle coolers for their needs. Therefore, portable mini cooler is the most viable solution for small needs of cooling beverages in Sri Lanka. Even though there are imported products available in the market, the cost of such machines and energy usage still at higher side for general public in Sri Lanka. Hence, there is a potential to develop more efficient mini cooler that can afford by middle class people in Sri Lanka. Portable mini cooler is the minimum viable product that we offer which is a result of R&D efforts taken by our team.

Available Competitive Technologies for Mini Coolers

There are competitive products available in the market that fulfill the same need by using mini car cooler.

Deluxe Silver Baby Fridge VS Mini Car Cooler



Deluxe Silver Fridge is an expensive product compared to Mini Car Cooler. Deluxe Cooler cost above \$40 and also high energy consuming.

USB Mini Powered Fridge Cooler VS Mini Car Cooler



Mini USB Cooler use 5V power supply of USB devices such as laptops. This product is low energy consuming product, but compare with Mini Car Cooler it's not effectively cool the beverages hence it takes more time to cool.

Tropicool 7 Liter Thermoelectric Cool Box VS Mini Car Cooler



This product use same mechanism use in Mini Car Cooler. But the limitation of this product is the price, which is very high in the market.

What is Mini Car Cooler?

The product we have developed fills this void by cooling drinks using a Thermoelectric cooling mechanism that can cool drinks and keep things cool. By eliminating the need for ice, our product has incorporated a huge improvement over current competitive products which used to cool drinks quickly. However, the incorporation of thermoelectric technology into our product makes it low cost than our competitors product. Our product also seems to be either equivalent or better than our competitors which resulted while we were analyzing its manufacturing, assembly process, failure modes and impact on the environment. The manufacturing and assembly process for our product has been simplified by using Peltier unit and Heat Sink to do the main process. In addition, the focus on using large number of standard parts were further simplifies in our manufacturing and assembly process. Our product has also been designed to ensure that the product can be assembled by press-fitting components from the bottom to the top. The process of manufacturing and assembly is very similar to our competitors because of the overlap of large number of components and similar structural designs.

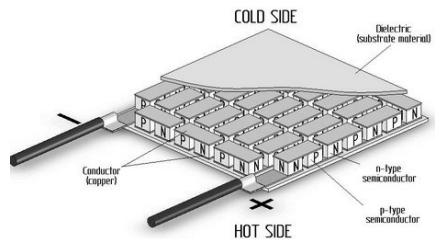
How It Works

Mini Car Cooler mainly consist with 3 main parts,

- Peltier Unit
- Heat Sink with Cooling Fan
- Upper Cooling Fan

Peltier Unit

Thermoelectric coolers operate by the Peltier effect (which also goes by the more general name thermoelectric effect). The device has two sides and when DC current flows through the device, it brings heat from one side to the other, so that one side gets cooler while the other gets hotter. The hot side is attached to a heat sink so that it remains at ambient temperature, while the cool side goes below room temperature. We used cold side to our mini cooler to make beverages cool.



Two unique semi-conductors, one n-type and one p-type, are used because they need to have different electron densities. The semi-conductors are placed thermally in parallel to each other and electrically in series and then joined with a thermally conducting plate on each side. When a voltage is applied to the free ends of the two semiconductors, there is a flow of DC current across the junction of the semi-conductors causing a temperature difference. The side with the cooling plate absorbs heat which is then moved to the other side end of the device where the heat sink is. TECs are typically connected side by side and sandwiched between two ceramic plates. The

cooling ability of the total unit is then proportional to the number of TECs in it.

Heat Sink with Cooling Fan



This heat sink use to absorb the heat of the Peltier unit. Absorbed heat will cool by the fan that attached to the heat sink.

Cooling Fan Attached Above the Cooler

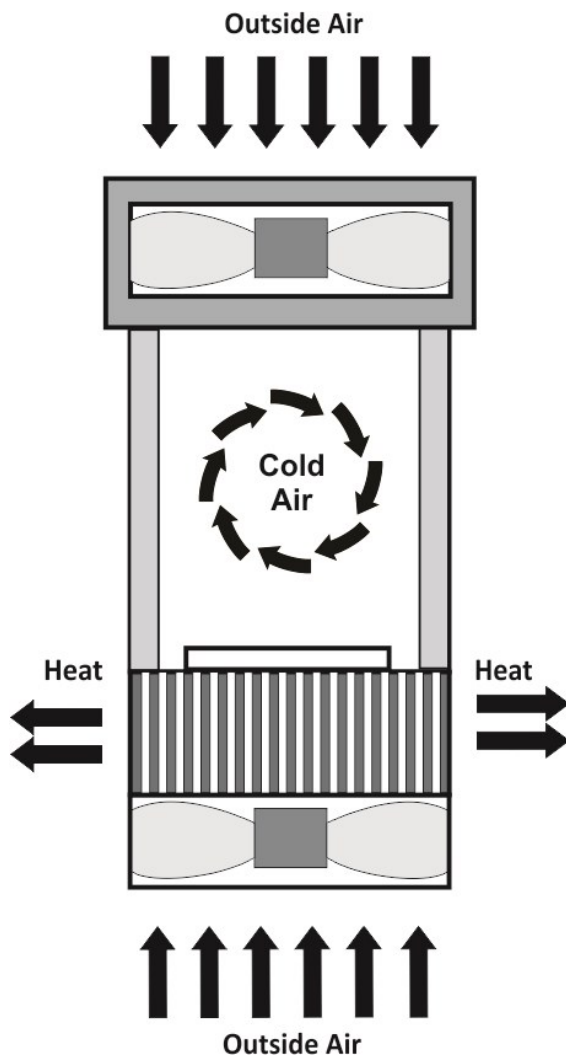
This cooling fan will blow additional cold air into mini car cooler and this air helps to carry the cold within the cooler.



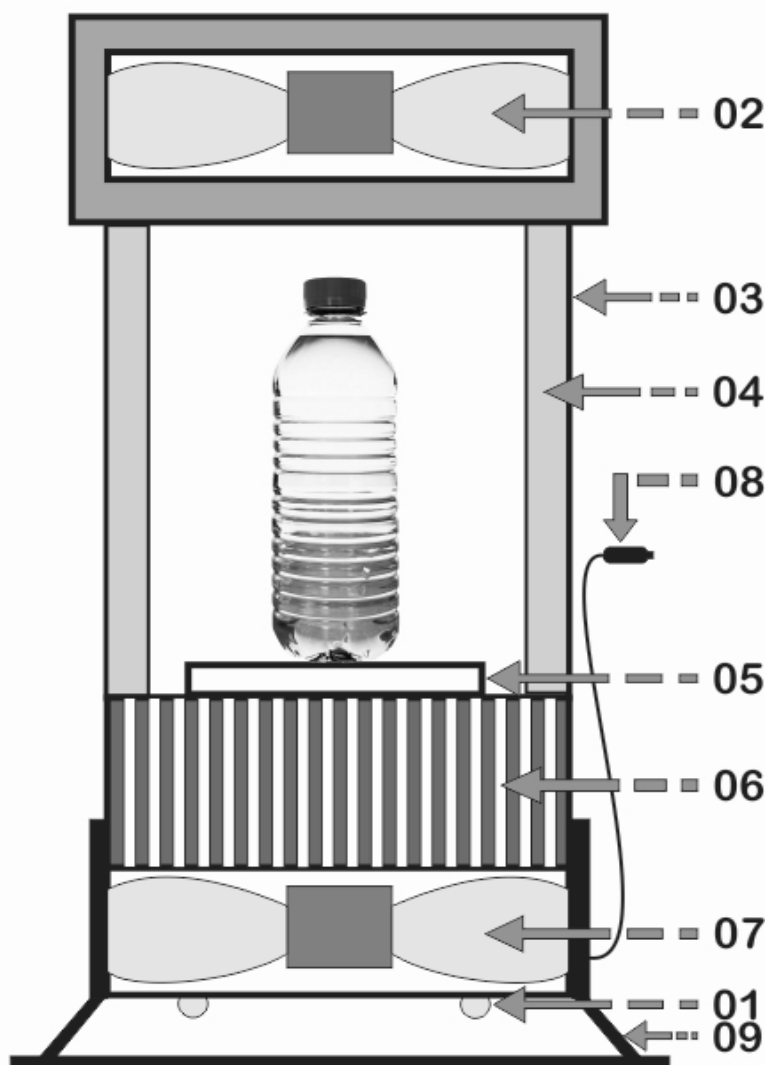
Mini Car Cooler Working Mechanism








The Mini Car Cooler use the Peltier to convert the hot air into cold air. From one end machine absorb the hot air in the outside. When the air flows through Peltier, it increases the moisture of the air to make it cooler. Then the fan

accelerates the flow of cold air to outside. This cold air normally reduces the cooler temperature and makes it colder. However, air temperature will not drop very quickly, yet sufficient enough to cool a beverage.



Essential Parts of Mini Cooler



| Part Number | Part | Number of Parts | Material | Manufacturing Process | Image | Need of part |
|-------------|--------------------------|-----------------|-----------|-----------------------|---|-------------------------|
| 01 | LED bulb | 01 | Assembled | Purchased Part |  | Interior decorate light |
| 02 | Cooling fan (Insulator) | 01 | Assembled | Purchased Part |  | Outside air will absorb |
| 03 | Outer Housing | 01 | Plastic | Injection Molding |  | Exterior decorate |
| 04 | Mac foil cover | 01 | Aluminum | Purchased Part |  | Storing Cold air inside |
| 05 | Peltier Unit | 01 | Assembled | Purchased Part |  | Generate Cold air |
| 06/07 | Heat Sink and Fan system | 01 | Assembled | Purchased Part |  | Absorb Heat air |
| 08 | Power Supply | 01 | Assembled | Purchased Part |  | Power supply to cooler |

Puredrop - Mini Filter

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Introduction

As we all know, Water is necessary for the survival of mankind. Without having drinking water people cannot survive in the world. However, it is



apparent that water sources are continually getting polluted and hence, finding the sanitized drinking water become major social problem in the world. Compared to sub Saharan African countries, Sri Lanka have

sufficient natural water sources that can provide drinking water. However, drinking water has become live threatening issue for some parts of the country due to contamination. It is scientifically found that major reason for kidney diseases in North-Central province in Sri Lanka is polluted water. Even though, it was highlighted in North-Central province, the treat is for the whole island as tap water does not guaranteed 100% contamination free.

The Problem

In Sri Lanka, it has been identified that there is a high sense of having pure water. People use water from tap lines for drinking and cooking. However,

tap water is not guaranteed for its purity. Through the cleaning process most of the visible dirt is removed, but invisible contaminations are there in tap water. Since there is a lack of pure water in urban areas, people have to buy bottled water by spending more money.

Tap water has been the most popular water source in metropolitan districts in Sri Lanka. Most of the people who are living in highly populated areas for a long time are using water from tap lines for their daily usages. But they have to drink water from tap lines that are not in a condition to use. By now, people are considering more to use pure water with increasing diseases due unclean water. As a result, there is increasing demand for water filters in the market. However, most of the products available in the market need to be filled by people themselves and still the water coming from tap lines has been contaminated.



There are other types of water filters available in the market to solve this issue. Some water filters can be fixed to water line where it can filter water coming into houses.



Even though these water filters are better to be used in households, fixing costs and cartridge replacement costs are relatively higher. Further, people do not need to purify the water to be used for toilets, gardening and other washing. Hence there is a need for small affordable water filter that can be fixed to tap nozzle without making any changes to the existing water line.

Tap Nozzle Water Filters

There were attempts taken to develop a small water filter that can be fixed to standard water tap nozzles.

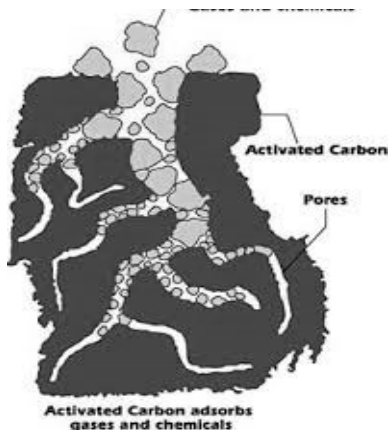


Most of these filters use filter form sheets to extract all the visible dirt from the water. Further they have use active carbon as a purifier to make water clean.

Active Carbon Water Purification

Charcoal is Carbon. Activated charcoal is charcoal that has been treated with oxygen to open up millions of tiny pores between the carbon atoms. The use of special manufacturing techniques results in highly porous charcoals that have surface areas of 300-2,000 square meters per gram. These so-called active, or activated, charcoals are widely used to adsorb odorous or colored substances from gases or liquids.

The word absorb is important here. When a material adsorbs something, it attaches to it by chemical attraction. The huge surface area of activated charcoal gives it countless bonding sites. When certain chemicals pass next to the carbon surface, they attach to the surface and are trapped. Activated charcoal is good at trapping other carbon-based impurities ("organic" chemicals), as well as things like chlorine. Many other chemicals are not attracted to carbon at all. For e.g. sodium, nitrates, etc. So they pass right through. This means that an activated charcoal filter will remove certain impurities while ignoring others. It also means that,



once all of the bonding sites are filled, an activated charcoal filter stops working. At that point it must replace the filter.

Several factors influence the effectiveness of activated charcoal. The pore size and distribution varies depending on the source of the carbon and the manufacturing process. Large organic molecules are absorbed better than smaller ones. Absorption tends to increase as pH and temperature decrease. Contaminants are also removed more effectively if they are in contact with the activated charcoal for a longer time, so flow rate through the charcoal affects filtration.

Pure Drop Concept

The initial product concept of the “Puredrop” was came up with the cheap tap nozzle purifier that is available in the market. It is a basic product that has just a filter layer and water fan that can do only minimum filtering. In



‘Puredrop’ the outer casing of this product was used as the product shell. However, the ‘Puredrop’ introduced active carbon layer and nylon filter at the bottom of the filter. It would give more effective filtering. Since it comes with the flexible rubber nozzle to fix to tap, it can be fixed in any standard size tap in the households.

Users can change the active carbon and nylon filter time to time or can replace the whole filter at once. It will be the first active carbon included tap nozzle water filter in the market. The main advantage of this filter is the

lesser cost hence subsequently will be the lowest price in the market and users can use it for more than three months without any problem.

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Introduction

Entering to a new market, with our new product, could be targeted as an option, where there is a high risk and uncertainly get involved. This diversification strategy should be analyzed in advance, in order to become successful, while creating sustainability throughout its product life cycle.

Currently most middle class consumers, like students, office workers and factory workers, are really in hurry to have their breakfast and lunch in a faster manner with a lower cost. So Maru Roti will enable the potential customer's get fully satisfied at their own budget.

The technological involvements are treated as negligence, where most functions of our products are totally band on hand made systems. The packaging will add a value to the product, where it attracts the consumers in a different manner. The rational consumer wills always focusing to obtain a service at a minimum resource requirement. Therefore Maru Roti will enable to cater a higher service, in terms of flavor, nutritious and tasty.

Field of the Innovation

“Are you hungry, here we are”

The Maru Roti is a totally innovative product where it's bringing an ultimate taste to the consumers through a simple meal. The special ingredients that we are using for our production is highly innovative. Also we have tested various flavors and inputs to ensure the taste and the nutritional quality of the product. As we mentioned in above, rational customers are keen to enjoy a maximum thing at a minimum effort. Therefore our product will enable them to enjoy a meal beyond the typical unhealthy pastry foods. The pricing strategies that have been used to price the product will also able to attract the customers. Further the product variety also will enable us to attract our potential customers in sustainable manner.

Description of the Related Products

Short eats are the state art for our kind of product types and larger number of bakery chains are currently cater the service to the consumers with a larger number of volumes. The major limitation of current bakery product is, it's just concentrating on limited flavors and limited choices. But it could be an adverse factor to others, where the choices and flavors are really different to each other. The Maru Roti would provide variety of flavors to the customers and create an edge over the market.

The simple production process with cleanliness could lead to reduce the costs associated with the product while differentiating from other competitors. The complex process of other substitute products will lead to increase the cost of

their ultimate products. When the customer is going to have their breakfast with a simple short eat, they are limited to a single flavor or variety. Also having a one item could not lead to satisfy their hunger where the time also really limited.

Objectives of the Project

The self-satisfaction, while enjoying out makes us motivate to do so. The consumer feedbacks and spreading the products all over our pre-determined geographical market segments could further motivate us to expand the operations.

The attractive features of our product are as follows.

1. The ingredient are healthy. (e.g. Rampa, Karapincha)
2. The Size - will satisfy the consumer a lot, where they have been fed up by having tiny items of short eats at once.
3. The packaging of the product is very convenient.
4. Product variety – two basic types of flavors are used basically in the initial stage. (flavor/ kurakkan)
5. The handmade methodology.

Brief Description of the Product

Maru Roti can be made in form of triangular, round or square shapes. After the rotis are cooked, it consist of several distinct layers. The outer layers are crisp while the inner layers are soft. The steps of how to make Maru Roti are given below.

Ingredients

- ✓ Wheat Flour –250g
- ✓ Salt
- ✓ Coconut oil
- ✓ Warm Water (as needed)
- ✓ Cheese
- ✓ Rampa
- ✓ Karapinch
- ✓ Green Chilies
- ✓ Onion
- ✓ Leeks

For layering

- ✓ Carrot
- ✓ Cabbage
- ✓ Potatoes
- ✓ Pepper
- ✓ Salmon
- ✓ Egg

Method

1. Chop leeks, Onion, Green Chilies, Rampa, Karapincha
2. Mix the flour, salt and oil. Add the cheese, chopped vegetables and put warm water little by little and knead the dough.
3. Knead the dough nicely till it becomes soft and pliable.
4. Cover it with a damp kitchen towel or plastic wrap and let it rest for at least 15 minutes.
5. Knead the dough again and make lemon sized balls.
6. Dip each ball into dry flour and roll it out into a small disc using a rolling pin.
7. Spread 2-3 drops of oil on this rolled out roti. Sprinkle little dry flour on it.
8. Heat a saucepan on medium high heat and place the roti on it.
9. When light brown spots appear, flip the roti.
10. After both the sides are cooked, remove from the saucepan and transfer to a hot pack to maintain its softness.
11. Then making layers by filling different packs (vegetable chops, salmon mixture and omelet)

Detailed Description

Maru Roti is our innovative product. Currently most middle class consumers, like students, office workers and factory workers are really in hurry to have their breakfast and lunch in a faster manner with a lower cost. So Maru Roti will enable the potential customer's get fully satisfied at their own budget.

The technological involvements are treated as negligence, where most functions of our products are totally band on hand made systems. The packaging will add a value to the product, where it attracts the consumers in a different manner. The rational consumer will always focus to obtain a service at a minimum resource requirement. Therefore Maru Roti will enable to cater a higher service in terms of flavor, nutritious and tasty.

The Maru Roti is a totally innovative product where it's bringing an ultimate taste to the consumers through a simple meal.

CHENA - Evaporative Air Conditioner

C.N. Wickramasinghe²

The Problem

Sri Lanka is a tropical country with 28-30 °C average temperature. It is quite hot and some month's temperature goes beyond 33°C. Hence, air-conditioning is desperate need in countries like Sri Lanka. However, income level and energy cost become hindrance to people to use regular Air conditioning machines in their home. Therefore, evaporative cooling technology is the most viable solution to air-conditioning homes in Sri Lanka. Even though there are imported products available in the market, the cost of the machines and energy usage still at higher side for common men in Sri Lanka. Hence, there was a potential to develop more efficient evaporative cooler that can afford by middle class people in Sri Lanka. CHENA Evaporative Air Conditioner is such the minimum viable product.

What is Evaporative Cooling?

Evaporative cooling is a natural phenomenon that can experience near water tanks, waterfalls and even near sea. Wind blow across the water surface and bring some of the water particles with air that significantly reduce the temperature around the area. Evaporative cooling occurs in environment when dry air blows across water surface like sea, river or water tank. In evaporative cooling, tiny water particles blowing with the air converted to

² Senior Lecturer, Department of Commerce and Financial Management, University of Kelaniya

gas where energy is exchanged. The result of this process reduces the air temperature.

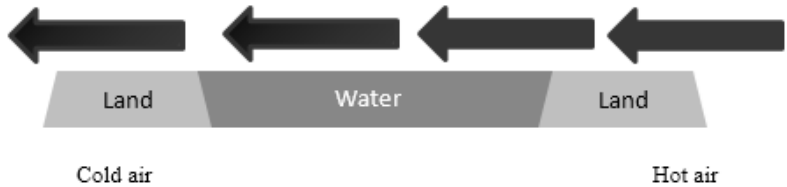


Fig. Natural Evaporative Cooling Mechanism

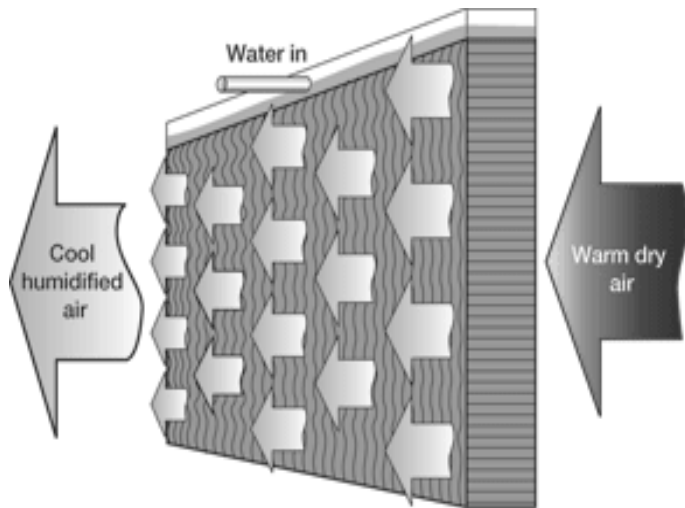
Beginning of Evaporative Coolers

The ancient Egyptians had a great need for air conditioning in their pyramids. They accomplished it by hanging wet blankets across the doors. When hot, dry air passes over water blanket the air cools off. They have used wooden cabin that used a fly roof as an air-conditioner by stretching a canvas tarp over the wooden frame and soaking the tarp with water for evaporative cooling.



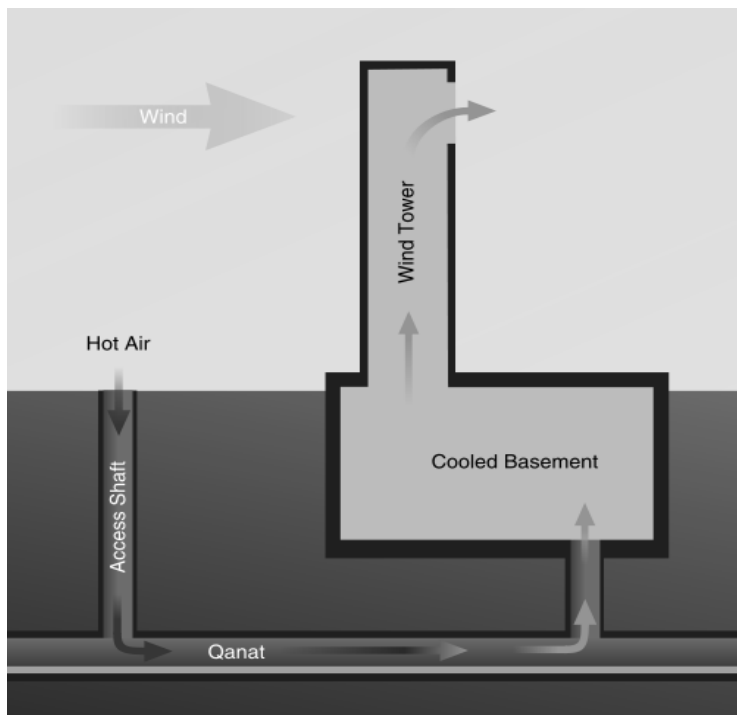
World first attempt for evaporative cooling by ancient Egypt

Further, they have built wind towers to mix cold air with the hot wind to make pyramids cooler. In pyramids hot air send to underground cool basement and send to wind tower that bring the cold air into higher wind. Then this colder air was expected to bring down the wind temperature to make the place cooler.



How Evaporative cooling works

Principle of this ancient air conditioning system still applicable in air cooling and this principle have been used even in modern air conditioners.

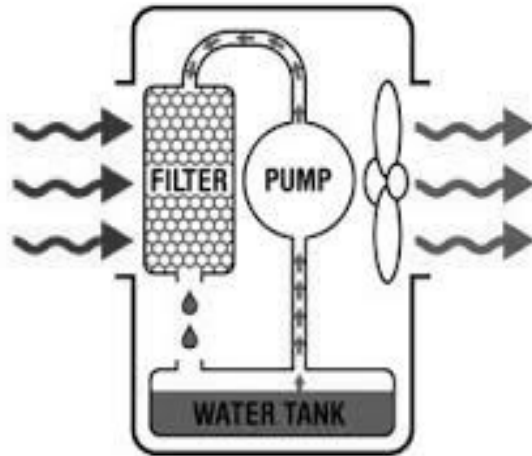


Principles of evaporative cooling

How Evaporative Air Conditioner Works?

Evaporative air-conditioners available in the today's market use the water/ice to convert the hot air into cold air. From one end machine absorb the hot air in the room. When the air flows through wet filter, it increases the moisture of the air to make it cooler. Then the fan accelerates the flow of cold air to outside (Airteck, 2008). This cold air normally reduces the room temperature and makes it colder. However, air temperature will not drop as normal air conditioner yet sufficient enough to make the room cooler. Except the lower

cool than the normal air-conditioner, there are many advantages of evaporative air-conditioning than air-conditioners.



Air-Conditioner VS. Evaporative Air-Conditioner

Evaporative Air-Conditioner is green. It will not use any gas or other chemical to make the air cooler. It is an accelerated natural process that makes the temperature down without polluting the environment.

Next, the **Evaporative Air-Conditioner** consume up to 10-15 times less energy than ACs. They consume less electricity and can also work in low voltage areas. As a result of that monthly electricity / power bills are significantly lower.

Evaporative Air-Conditioner requires low maintenance; you rarely need to summon a mechanic for maintenance or troubleshooting as in the case of ACs.

Evaporative Air-Conditioner present significant environmental benefits with no harmful Chlorofluorocarbons (CFC) emissions and very low power consumption.



Following table indicates the comparison of parameters between Evaporative AC and general AC. It clearly shows Evaporative AC is much better option than the general AC (Sympony Limited, 2013).

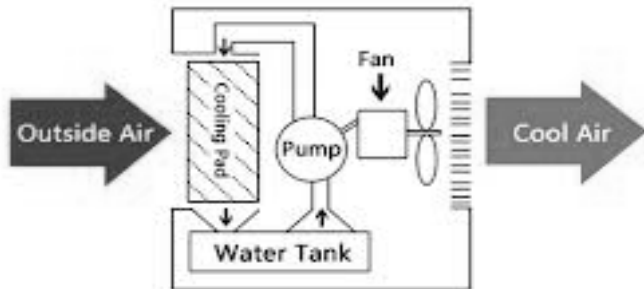
| Parameters | Evaporative AC | Air Conditioner |
|--------------------|------------------------------|-----------------------------|
| Capital Cost | Low | High |
| Recurring Cost | 90% lower than AC | Very High |
| Indoor Air Quality | 100% Fresh Filtered Cool Air | Stale Dry Air Re-circulated |
| Refrigerants | Water | Polluting Refrigerants |
| Maintenance | Simple & Cost Effective | Complex & Expensive |
| Portability | Yes | No |
| Usage | Outdoor & Indoor | Indoor Only |
| Emission | Eco-friendly | Environmentally Harmful CFC |
| Carbon Emissions | Nil | Very High |

Power Consumption of Evaporative Coolers in the Market

Even though evaporative air conditioners, which are available in the market sufficient to reduce the air temperature at home, it still burns higher electricity. To keep the filter wet, all the time there should be water pump working while air-conditioner is on. As then there is high power fan to send the cold air into room. Normally energy efficient branded Evaporative AC consume at least 100-150 watts. Compared to general AC machine, it is much cheaper; however, daily usage would cause increased electricity bill in country like Sri Lanka. Further, most of the machine available in the market is range from SLRs. 7,000 – 20,000. Hence, there might be high market potential for a low cost and low energy consuming evaporative AC in the market.

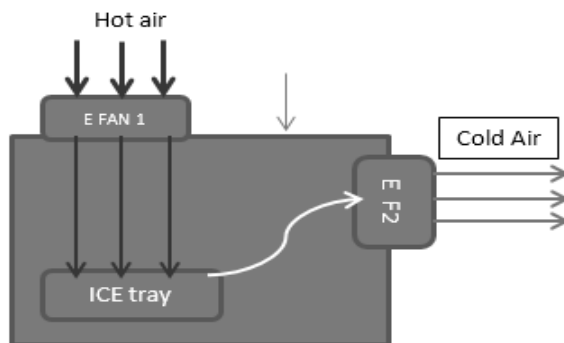
How CHENA Air-Cooler Works?

Main objective of the CHENA air-cooler was to reduce the energy consumption by eliminating the water pump from the cooler. Basic concept for the product was taken from the evaporative cooling technology that is available in the existing evaporative coolers. Significant change that was made in CHENA air-cooler is elimination of water tank, pump and cooling pad from the machine. Instead of these units CHENA air-cooler uses ice block as an alternative. Its gives much more efficient cooling for long time, even ice block melted, remaining cold water would give colder air than traditional evaporative air-coolers. Traditional evaporative air-conditioners get the outside hot air into the machine by single exhaust fan. In order to increase the volume of outside air come into the sealed container, CHENA



Working Principle Diagram of Evaporative Air Coolers

uses 35 watt exhaust fan. This fan blows the outside air into the container where the ice block is located. This outside air vaporizes the ice into gas and increase the humidity of the air inside the container. CHENA use another smaller exhaust fan to blow out the cold air to outside. The fan is less powered compared to earlier said exhaust fan. The blowing air is full of cold water particles that reduce the temperature in quick time.



How CHENA works?

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Handy Ruler

Jinadasa A.R.P., Madushani B.V.N., Thashani E.W.A., Tissera H.A.T.M.

Introduction

Currently Sri Lanka is not only limited to a traditional agricultural economy, yet has a developing industrial economy. Even though there is no multinational industrial sector, Sri Lankan people engage in industrial section as small scale businesses and give their contribution to GDP in different ways. This sector is mainly suffering from lack of preliminary capital investment and technological deficiencies where they can't buy their essential tools. Due to this reason they are facing inefficiencies and inadequate safety problems. Handy Craft Carpenters, tailors, mechanics, electricians, building constructors and also pupils are taken into consideration mainly under this concept. For their easier usage we integrate two gadget tools into a one.

The Problem

Design ruler and cutter are two most important tools. Designers and craftsmen need to draw straight lines and cut boards, plastics and forms through that line. Sometimes school children also need to do activities as such in schools. However there are no multi-purpose tools that can satisfy both the needs.

What is this Special Ruler and How it Works?

This special ruler can be used by the people who engage in special industrial sector and also by the school children (target market). This special ruler is made in iron and steel and about one feet. Normal ruler has two edges with

centimeters and inches. But this special ruler consists two edges in one edge with centimeters and inches (Both are numbered in one edge). First layer represents centimeters and other layer as inches. Also the centimeter numbered layer has small slope which begin with inches numbered layer. It is easiest way to identify whether inches or centimeters and help to make measurements according to the user requirement. Another edge is consist of sharpener or blade. Due to that slope another edge will be thick rather than numbering side. Therefore sharpener/blade can be fixed in the middle hole of this side (fixed with led burning). Therefore we can use this ruler not only for measurements but also for the cutting (make as pencil sharpener, cutting cardboard, and cloth). Also this sharpener covered with plastic clip. It is easy to remove and fit again with swipe and tug (just like plastic cover). It make sufficient safety for user and it has small two holes (cercal shape) for easier to handle.

Normal Ruler vs. Special Ruler

This ruler was made by steel and iron (mixture), and will prevent from damage. This tool, we can use for different purposes. By having this tool we don't want to buy a sharpener and a ruler separately. Therefore it will save our money and good for our budget. Normal rulers haven't this special feature and those are used only for measurements. But this ruler's sharpener side help to do lots of work. (For handy craft creation, as a pencil cutter, cutting cardboard, cutting cloth, cutting thread, cutting cables, for weaving things etc.).

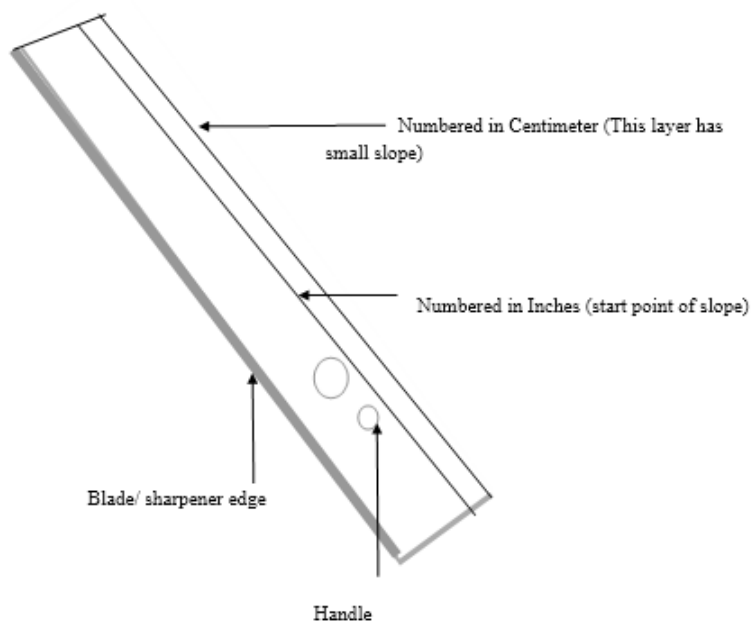


Normal blades / sharpeners



Normal rulers

Special Ruler



This is plastic clip. It help to cover the blade side. It has small lengthy hole and fit with blade.

Smart Tag Detector Counters

Raveen Perera

In conventional supermarkets, the billing should be done manually by using barcodes. The cashier should take item by item in order to bill the entire shopping cart. This process consume significant time and queues near counters can be seen in most of the supermarkets. This can also stress the cashier and because of that there is a possibility of making human errors. Thefts also can be happened as they can take goods inside pockets and bags.

Smart tag or RFID tag is a small, inexpensive coded electronic chip which can be placed on products or in containers. RFID system usually consists of several components, including tags, tag readers, edge servers, and middleware and application software. The tag contains a transponder with a digital memory chip that is given a unique electronic product code. The tag reader, an antenna packaged with a receiver and decoder, emits a signal



activating the RFID tag so it can read and write data on it. When RFID tag passes the electromagnetic zone, it detects the reader's activation signal. The reader decodes the data encoded in the tags integrated circuit and the data is passed to the host computer.

RFID Gate



RFID Tag

This concept is already using in logistics and stock keeping, but this can also be used in retail activities effective as well. Each counter of a supermarket can give an electromagnetic gate (similar to a metal detector) and when the customer passes through it all the items in the shopping cart will be automatically billed and even the inventory balancing will be done real-time. It will be a highly efficient billing mechanism as the cashier only needs to collect money. It will also save cost of additional employee in the baggage counter as with smart tags all the products even they inside pockets or bags will be billed, so there won't be a need for a baggage counter. Cashier can cross check the bill with number of items purchased when items are put into bags. In this system it will take average 10 seconds to bill 40 items.

This can be successfully implemented in fashion stores and even at railway station (ticket check). Cost of smart tags will be inexpensive as it meets economies of scale.

Lap Table

Indrachapa R.G.P., Jayawardana L.J., Ranadinghe H.W.K.G.,
Sandeepani G.A.S.P.

The Problem

Computer has made a very vital impact on society. In fact it has changed the way of life. The use of computer technology has affected every field of life. Majority of people are using computers to perform different task easily and quickly. It also saves time and overall cost to complete a particular task. Computers help to fulfil the educational purposes. Most of the fields such as medical, business, industry, airline and weather forecasting are using computer technology. Although the essentialness of computers is very high, it is not easy to use computers every time. Desktop computers cannot bring everywhere. Users have to use that by keeping it on a table. Usage of desktop computers is very low today due to that case. Nowadays, majority of people are using laptop computers. In Sri Lanka most of people are using laptops to do their things easily. But there also can see problems when using laptops. For an example, when users use laptops for the designing tasks, users have to conduct mouse pointer very freely with our free hand for that kind of tasks. Then a need of a laptop table will arise and it's better if that is movable one. And it is very comfortable if users can store that table in our lap bag. And also there are health problems when using the laptops on the laps of people for a long period. Then it is better to having a featured lap table for those users.

What is a Lap Table?

Lap table is a table that can carry everywhere easily because it has low weight. Also users can adjust the height of the table with adjustable legs. The table can use indoor and outdoor and it can stored in the lap bag by folding its legs.

There are some lap tables which can keep the laptop and movable.



The Technology of Lap Table

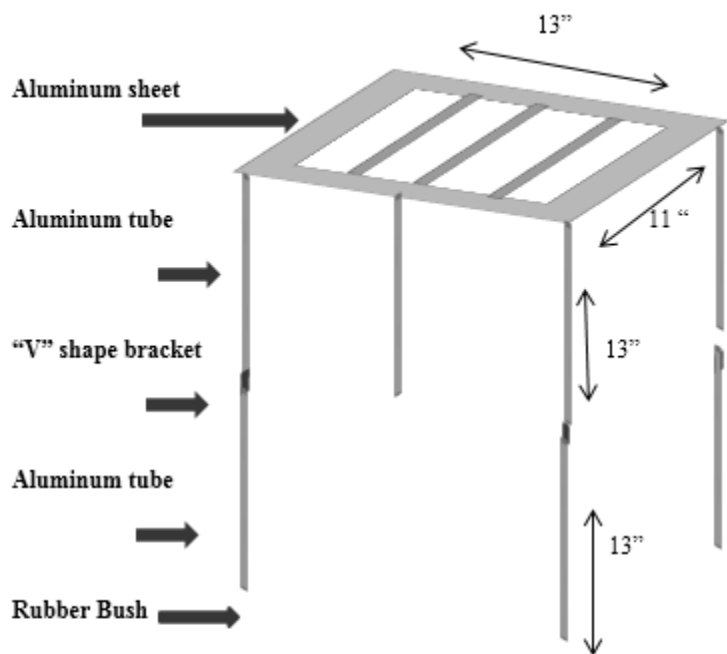
Main objective of this table is to reduce the space to store the table and it will reduce the deceases that occur when using laptops on the laps for a long period. The basic concept for this table was taken from other laptop tables available in the market and in here we added another special feature for more effective and efficient usage.

This table is made by Aluminum tubes. It helps to minimize the weight of the table and it enhances high strength. For the purpose of folding legs we can use “V” brackets and they lock again when the table is using. All these aluminum tubes are only 13” of length. Also we can use rubber bushes at the end of the legs and it will helps to stand the table in floor without damaging the floor.



How the Table Works

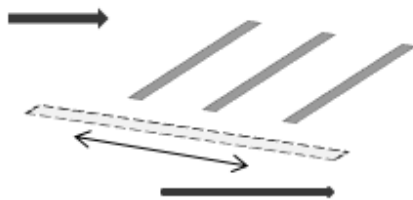
The following picture shows the sketch of the lap table on the aluminum sheet users can keep the laptop. There are aluminum tubes in the middle of aluminum sheet and it will healthy to cooling system of the laptop rather than using fully aluminum sheet. By folding the V brackets, legs can fit with the aluminum sheets and then it can store in the lap bag easily.



This is the aluminum sheet that uses for keeping laptop and the middle of this there are aluminum tubes. The length of sheet is 13" and width is 11".



Aluminum Sheet



Aluminum tube (leg) 13"

Aluminum Tube



13"

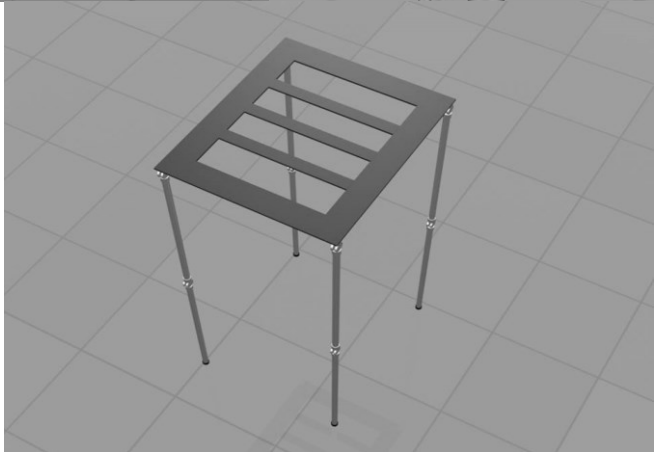
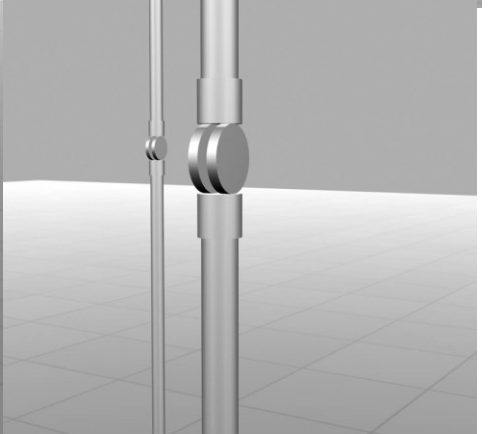
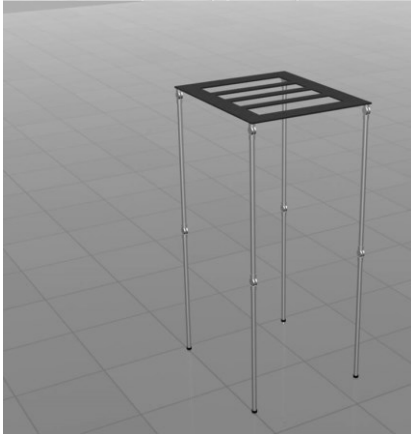
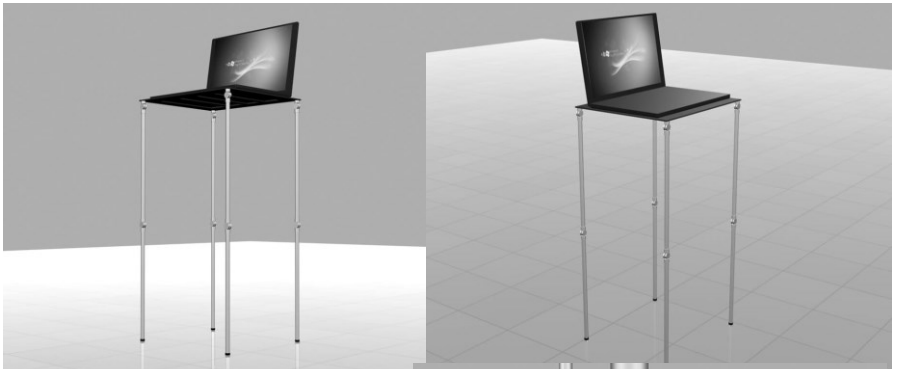
"V" shape bracket



13"

13"

13" aluminum tubes are connect with "v" shape brackets and they help to fold easily.



Tiptop Tippex Pen

Jinadasa A.R.P., Thashani E.W.A., Kumari M.M.U.N., Malsha K.A.I.,
Thissera H.A.T.M.

The Problem

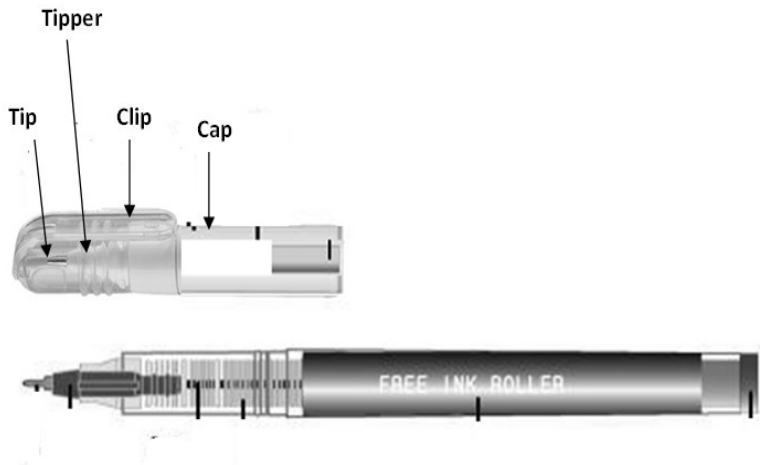
People who work on papers and carbon pens mostly use a tippex pen for erase incorrect writings. But when using a tippex pen as a separate item, it take additional space to carry and sometimes forget to take it. However tippex pen is not utilized all the time and have to spend considerable amount of money to buy it. Therefore Tiptop pen is viable solution that consist carbon pen and tippex in a one product which could be used effectively and also affordable.

What is Tiptop Pen?

Tiptop pen is a stationary item that developed by combining a tippex and a carbon pen. The tippex liquid will be filled on the carbon pen cap. Tip and tipper attached to the carbon pen cap head can use the liquid by press on tip. Cap of the tippex consist with clip which could use to hang on.

How Tiptop Pen Works?

Tiptop pen will remove the pen cap and hang on the end plug of pen. Then remove the cap of tippex and press the tip. When tip is pressed the liquid will flow smoothly. However the stop press on tip, the flow of liquid also stops.

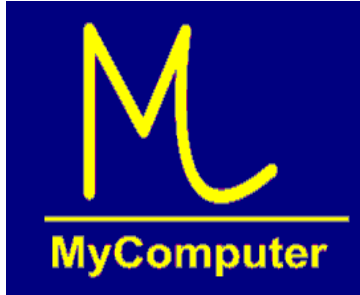


Tiptop Pen Vs Tippex Pen

- Tiptop pen combine tippex and carbon pen which are complementary goods. Because of that tippex is no longer used separately.
- Tiptop pen consist tippex and also carbon pen which can satisfy two set of activity (write and erase). Therefore it is easy to use within a little time.
- Tiptop pen is easy to carry and does not want to additional space to carry.
- Tiptop pen could be develop be using small amount of recourses than the tippex pen

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