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Материалы сборника посвящены актуальным проблемам развития ТРИЗ технологий.

Приводимые материалы могут быть полезны преподавателям вузов, руководителям предприятий, а также студентам и аспирантам технических специальностей и направлений.

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WALL HEATER TRANSFORMER TYPE WITH INTERMEDIATE HEAT CARRIER

The paper goal is to represent the development of more technologically advanced, safe and reliable heating devices. It proposed a more reliable and safe transformer fluid coolant heater in standard radiators.

Central heating has a number of challenges for the delivery of heat to consumers. There are heat losses on heating mains. In the apartments of apartment buildings there is an uneven distribution of temperature in the flats (difference reaches 15-18 degrees). The temperature distribution in apartment buildings is dependent on several factors: location of the apartment regarding the external walls and floors, the location of risers heating and water distribution in them. The output of this situation is to install individual meters heat supply, thermal regulators in apartments with fever and other sources of heat in homes with low temperature.

One of the safest and technologically advanced sources of additional heat in the apartment can be wall-mounted heater transformer type with an intermediate heat transfer fluid. The principle of operation of such a heater is described in [1] and consists of heating intermediate heat - mineral oil (or water) in the secondary circuit of the transformer and supplying it to the standard effective heating radiators. The current flowing through the secondary circuit in the form of a specific section of the metal tube heats it, and the tube, in turn, heats the transformer oil circulating in the system and the heater radiator. Figure 1 shows the oil circulation system (water) and the secondary current transformer. Oil circulation is ensured by natural convection during heating (arrow upward movement of oil in the area of current circulation) and cooling (arrow down oil movement in the area of heat sink). In the process of research of this heater were performed: electromagnetic toroidal inductor calculation, structural analysis, cross-section and resistance of the secondary circuit, thermal calculations of the inductor, the secondary circuit and radiator to meet the requirements for allowable temperature external surfaces of the device. Calculations showed that the secondary side of the transformer is shown the effect of current displacement on the surface of the circuit, which greatly complicates the calculation of the optimum cross-section and resistance circuit.

This effect is minimized for non-magnetic materials. Therefore, the optimal material for the secondary circuit is aluminum or an alloy thereof. One of the criteria of the electromagnetic and thermal calculations are body temperature radiator and the oil in the upper layers of the secondary circuit, which must not exceed the permissible values, so, about 85 degrees. Application of transformer heating can significantly increase the life of the heating elements in comparison with the heating elements, to upgrade the electrical device. Use of oil as intermediate coolant

avoids corrosion of the metal elements of the heater , and thus improve its reliability and to increase the maximum operating temperature of the coolant.

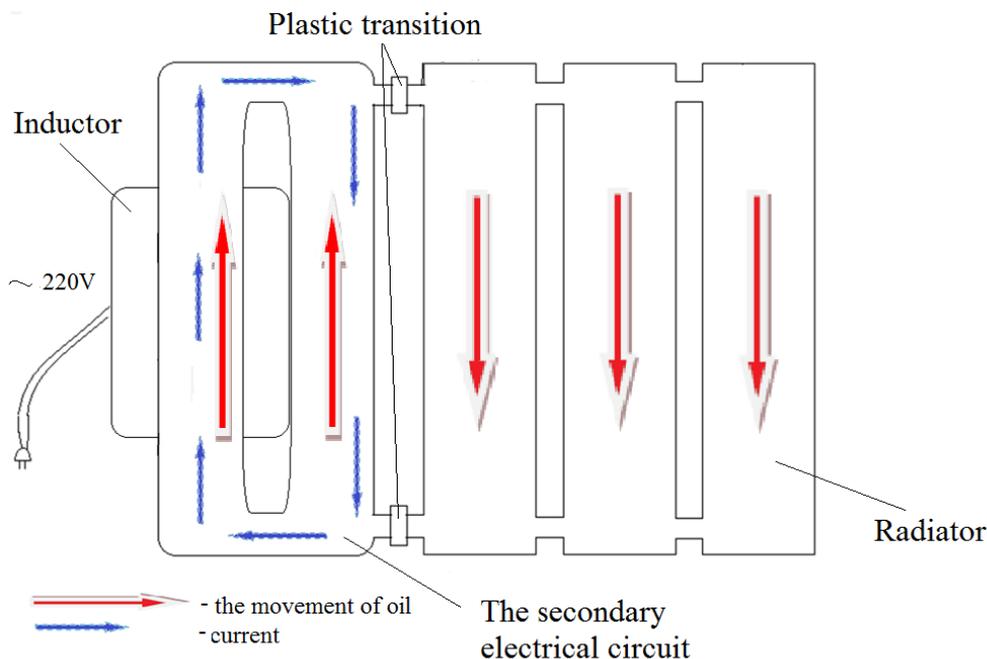


Figure 1 - The oil circuit and the secondary current of the transformer - inductor in the proposed wall heater

Monitoring temperatures in residential complexes shows that about 20 % of apartments in the nine-storey apartment buildings need to install these heaters, which improves the comfort of living. According to our estimates in extra heaters in said volume reduction is achieved by variation of temperatures from 20-25 % to 8-10 % of the average temperature in the building. The appearance of these heaters and the installation location is different from the type and placement of central heating radiators. They can be switched periodically at the request of the person in the apartment on and off in his absence, providing a cost-effective power.

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KEYBOARD FOR PROGRAMMERS

The aim of this work is to study the problem associated with the set of functions and procedures in the code. The main challenge was finding a way to solve this problem. The study suggested several ways to solve this problem. For programmers a set of variables and procedures in the code is a big waste of time, because many procedures are repeated. It is advisable to come up with a device that will connect to a PC via USB. This method of solution will reduce the set time code. One of the advantages of this method is to increase the productivity.

Over time, the number of specialists in the field of programming greatly increased. A similar growth trend is observed among programmers in VBA (Visual Basic for Application). Every specialist in this field is faced with the problem of the permanent set of the same procedures, functions, declaring variables, constants, etc., which leads to higher costs time.

From figure one it can be concluded that the procedure functions, declaring variables, constants, etc. is continuously repeated in all the examples, the code.

```
Private Sub ReadData(ByVal sender)
    Dim pMxDoc As IMxDocument
    pMxDoc = My.ArcMap.Document
    Dim pMap As IMap
    pMap = pMxDoc.FocusMap
    Dim pFLayer As IFeatureSelection

    Dim Count As Integer
    For Count = 0 To pMap.LayerCount - 1
        If pMap.Layer(Count).Name = "Counties" Then
            pFLayer = pMap.Layer(Count)

            Dim pFCursor As IFeatureCursor = Nothing
            pFLayer.SelectionSet.Search(Nothing, False, pFCursor)

            Dim pF As IFeature
            pF = pFCursor.NextFeature

            If pFLayer.SelectionSet.Count <> 0 Then
                lblCountyName.Text = pF.Value(pF.Fields.FindField("NAME"))
                lblStateName.Text = pF.Value(pF.Fields.FindField("STATE_NAME"))
                lblPopulation.Text = pF.Value(pF.Fields.FindField("POP2000"))
                lblArea.Text = pF.Value(pF.Fields.FindField("AREA"))
            Else
                If sender = "Button" Then MsgBox("Please select a county")
            End If
        End If
    Next Count
End Sub
```

Figure 1

At the moment there are many different keyboards, ranging from the standard "Das Keyboard" to a totally modified keyboard type "Maltron Full Ergonomic 3D".



Figure 2 - Standard keyboard «Das Keyboard»



Figure 3 - Keyboard «Maltron Fully Ergonomic 3D»

All existing keyboards differ in the arrangement of standard keys, the keyboard material and shape of the next keyboard.



Figure 4 - Keyboard Roll& Go Flexible Keyboard

For programmers there is a separate mechanical keyboard CODE which was invented by the American computer programmer. In such a keyboard includes additional features such as:

- the ability to change the layout of one key (Windows, Mac, Dvorak, or Colemak);
- support for multimedia keys (with FN button – you can mute, change screen brightness, etc.).

But none of the keyboards does not solve the identified problems.

The ideal final result - this is the result sought by each system. In this case, the perfect end result is a keyboard that has all the standard keys as well as keys

with repetitive procedures, functions, variable declarations, constants, etc., but it is convenient and compact.

Let us analyze the frequency of repetition of code elements (Table 1).

Table 1

Frequency of the repetition of code elements

The element code	Frequency	The element code	Frequency
As	9	Private sub	4
If	9	For	3
Dim	8	As integer	3
Value	8	MsgBox	3
End	7	End sub	2
Then	5	To	2
pF	4	Else	2
Text	4	Next	2
Sub	4	As Ifeature	2

As a result of receiving the ideal final result you encounter the following technical contradiction: When increasing the set of keys on the keyboard unacceptably increases the size of the keyboard.

The way of solving technical contradictions:

- Using the principle of replacement of mechanical schema: create app virtual keyboard with a new set of keys.

- The use of the principle of separation: branch of additional power the keyboard, with the keys of procedures and functions, which, if necessary, will be joining the standard keyboard by USB input.

IMPROVED BACKPACK TO PREVENT BACKACHE DURING HIKING

1. Matter. Situation. Many people had pain on their back during hiking. Because weight push their back continuously.

Press Release: many articles describe a fact that the more we have outdoor activity, the more we have backache; the muscle which balances our body had gotten weight continuously, giving injuries on our back.

Interview. We interviewed 2 special forces. Both trained by mountain running with weighted backpack they said that decreasing stress on their back is one of important things to do their operation.

Requirements: decrease feeling weight / real weight; using minimum materials.

2. Analysis. 9-Window. We analyzed one of the TRIZ tools, 9-windows. It centered our main problem, and wrote its past. System on left (Package) and wrote its future system (Move itself). Also wrote its upper system (Transfer) and downer system (Pocket). At last we finished all windows and system.

Analysis: function analysis (Cost); (1) Table – make a table which describes all of elements and their connection; (2) Map – make table as a map to understand easily.

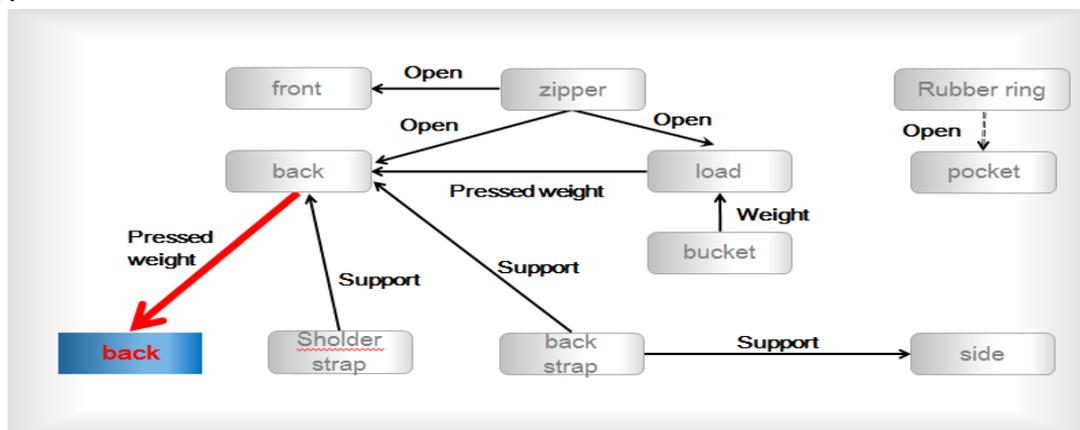


Figure 1 – Structural scheme

Root-Cause-Analysis (Quality). (1) To recognize our problem's reason we did RCA. Root cause analysis (RCA) is a method of problem solving used for identifying the **root causes** of faults or problems. So we identified its reason and find the real reason of our problem. Most of our weight problem is caused by materials in the backpack. It gives irregularity on our back.

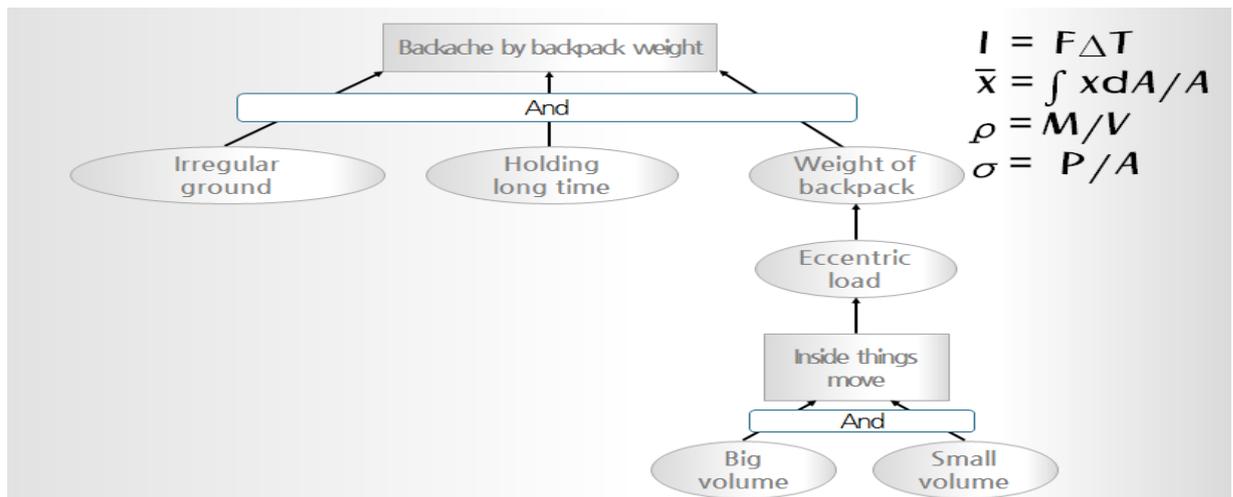


Figure 2 – Root-Cause-Analysis

3. As-is, To-be. As-is. It is the system of present time. It have problem to be solved. We have continuous weight on our back during trek and running on mountain. The cumulative duration of weight causes increase of Fatigue and Increase of Fatigue may cause possibility of Backache.

To-be. We solve our problem and our bodies are able to withstand long time by distributing the weight. Design backpack which avoid fatigue on the back.

4. Resource. Before Having analyzed our resources, We found that all material is controlled by Mechanical rules.

Our backpack is composed of 5 parts and 2 upper system. Hiking equipment which is the main weight we solved and bucket supplying water, back part which inflict the load in the man's back, front part surrounding the hiking equipment, side part which link front with back part.

Upper system is environment where we did our activity. Mountain terrain and long time. Mountain terrains have many bending and severe slope. And we have to withstand the weight long time.

5. IFR Our IFR is that sentence: **Support the weight on the back but we can't feel the weight.**

6. Contradiction. Technical Contradiction



Figure 3 – Definition of the contradiction

We have technical contradiction that we have weight of moving object. It gives both support and damages and narrow area of backpack's back part is the key

to solve our problem.

Solve Contradiction. We used the 40 kinds of principles of TRIZ. Our problem is weight of moving object and our subject is Area of moving object. The principles of TRIZ gave 4 ways : extraction, change dimension, use hydraulic, asymmetric way. We chose using hydraulic.

Physical contradiction.Contradiction and solution. Backpack's back support man's back but it damages. (contradiction).

It gives shear stress on our back. So we expanding the area of back part to decrease shear stresses and weight.

7. Solution. At first we replace plastic bucket for carmelbak which we used from past. It is made of by elastic materials if we pour water or air in the carmelbak, it has hydraulics. It absorbs shock on our back like suspension of car. Also it enlarges area of back part.

We added the hydraulic system with thoracic and enlarge the thoracic area to decrease shear stress we meets both technical and physical standards.



Figure 4 – Final solution

We did an experiment with our alpinism club of our university during their outdoor activity, they used our proto type and got a meaningful results

- 1) They moved more than 15% distance at the same time;
- 2) Their fatigues had been decreased.

So we know that we had solved our problem.

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THE SMART BUS STOP

Abstract

Background

As many people use smartphones, people sometimes miss the bus using smartphone at quite bus stops. And people ask for stop suddenly, it cause sudden start for buses.

Methods

The solution is from ADRIGE algorithm of TRIZ.

Result

The function which send information to bus from bus stop is added to exist-ing system so that drivers can recognize if passengers are getting on at quite bus stops even though they are not watching buses coming.

Conclusion

It reduces nonstop, sudden stop and unnecessary stop and as result, it de-creases waste of fuel, accidents, stress.

1. Introduction

1.1. Purpose. Background of Research

Passengers often miss buses using smartphones at quite bus stops. If they don't ask for stop in advance, drivers might misunderstand they are not getting on and don't stop. Or passengers recognize the bus later and ask for stop suddenly and it causes sudden stop of bus. Sudden stop is the biggest causes of accident and waste of fuel.

The purpose of this system is reduction of nonstop, sudden stop and unne-cessary stop informing if passengers are getting on to bus drivers ,and asking for stop to buses while doing other thing at quite bus stops.

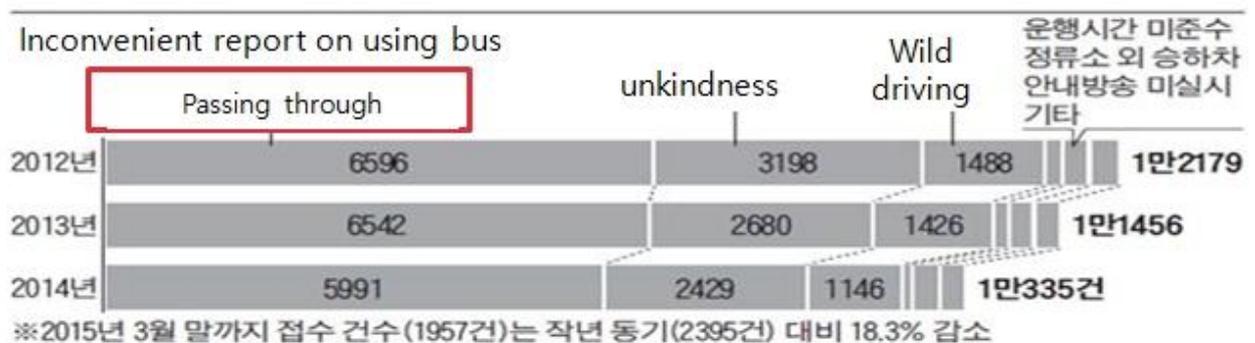


Figure 1 – Cases of claim from passenger (Kyunggi Transportation Training Institute)

It shows nonstop takes the biggest proportion of claims from passengers.

1.2. Research method

Current situation and fundamental reason are defined using ADRIGE algorithm of TRIZ and problem is set using Root Cause Analysis and after that, IFR is defined and the solution is drawn using resource.

2. Analysis of Problem

2.1. Definition of Current situation

(1) Undesirable Situation.

Undesirable situation is missing bus doing other things.

(2) Operating Zone, Operation Time.

Operation Zone is quite bus stops and Operation Time is the time after bus driver recognize passengers.

(3) Set Fundamental Reason.

Fundamental reason is not asking for stop to bus doing other things.

2.2 Analysis of Cause-and-Effect

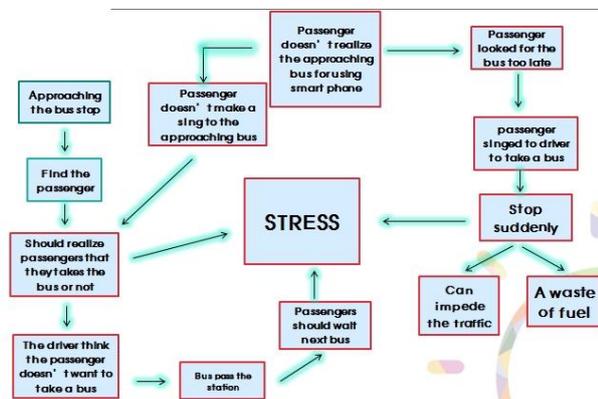


Figure 2 – Analysis problem's cause and effect

(1) Set Problem

There is no system to ask for stop to a coming bus for passengers. Passengers need this system and drivers need a system which informs if passengers are getting on.

3. Draw Solution

3.1. Resource Utilization and Definition of IFR

(1) Analysis of Current System Function and Function diagram

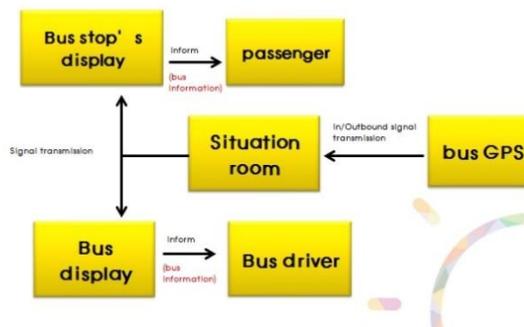


Figure 3 – Diagram of Current Bus Information System

Current Bus Information System is a one-way system to bus stop from bus.
 (2) Selection of Additional Function

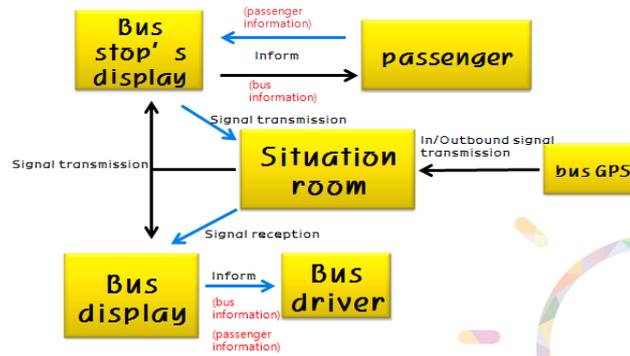


Figure 4 – Adding a function to current system.

A function which transfer information from bus stop to situation room and bus is added to normal communication system.

(3) Selection of MATCEM

electro-magnetic resource is utilized among MATCEM.

(4) Definition of Ideal Final Result

The bus I am going to take sops by itself.

4. Realization of Solution

Function button is located where people can reach easily. and there is ‘Choose the bus number’ menu in the function button.

Passengers can insert the bus number which they want using ‘Choose the bus number’ menu. At that time, several bus numbers are regarded as a group.

If the first bus among those several bus numbers passes, the rest of the bus numbers are deleted. The bus numbers chosen by passengers is transmitted to the buses and shown to the bus driver’s display turning on the light of ‘Next stop passengers’ menu.



Figure 5 – Overall Implementation of System

3. Conclusion

Passengers can let bus drivers know just using simple system. Even though passengers don’t recognize coming bus while using smartphones or doing other

things, drivers know there are passengers getting on and stop at the bus stop which passengers are waiting at.

As result, this system reduces not only missing buses but also accidents and waste of fuel by sudden stop.

TRIZ THE EVOLUTION OF FISHING TECHNIQUES

Fishing is the activity of trying to catch fish. Fishing is divided into amateur and sports. Unlike fishery, fishing is a hobby, a kind of rest, tourism and sport.

The fishing is an ancient practice that dates back at least to the Upper Paleolithic period, which began about 40000 years ago. Archaeological features such as shell mussel discarded fish bones and cave painting show that sea foods were important for survival.

Fishing history is inseparably linked with the history of mankind. Fishing helped the ancient person to survive and pass all tests of natural selection. We can only guess on rock painting, how our ancestors fished.

The type of fishing which we consider the season: summer, the place: from the coast, freshwater, the subject: predatory fish. Let's consider fishing for predatory fish. For example, lenok is a predatory fish.

All methods of fishing lenok in sport fishery are based on the predatory instincts of this fish.

Therefore, in most cases for catching large lenok you can use either a fly-fishing or a spinning tackle.

Using the fly-fishing, a fisherman must remember that flies, which imitate natural insects often, serve as food for the lenok, can give the best results.

There are too many baits for lenok. It includes. Spinners and wobblers and krollers, and an artificial mouse are among them.

Hands of the person were the first instrument of fishing. But there is a contradiction. We propose to solve this contradiction in using - The principle of Local quality. We get a solution: The use of the spear.

Then arises the following contradiction: For increase in quantity of the hooked fish, it is necessary to reduce the smoothness of hands. The principle of Nesting doll. And solution is - To create gloves

Next – the spear. Contradiction: For increase in quantity of the hooked fish, it is necessary to increase the size of stick. The principle of Flexible Membranes/Thin Films. The spear on a rope.

Several contradictions emerge parallel to each other. We will consider Contradiction: For increase in quantity of the hooked fish, it is necessary to decrease the sharpening angle of a spear. The principle of Local quality. We get a solution: The spear with a stone tip.

Next the spear on a rope and the spear with barbs. Contradiction: For increase in quantity of the hooked fish, it is necessary to increase of roughness of spear. The principle of Merging, Segmentation. The spear on a rope with sharp barbs.

On fig. 1 you can see the whole scheme of the evolution of fishing techniques.

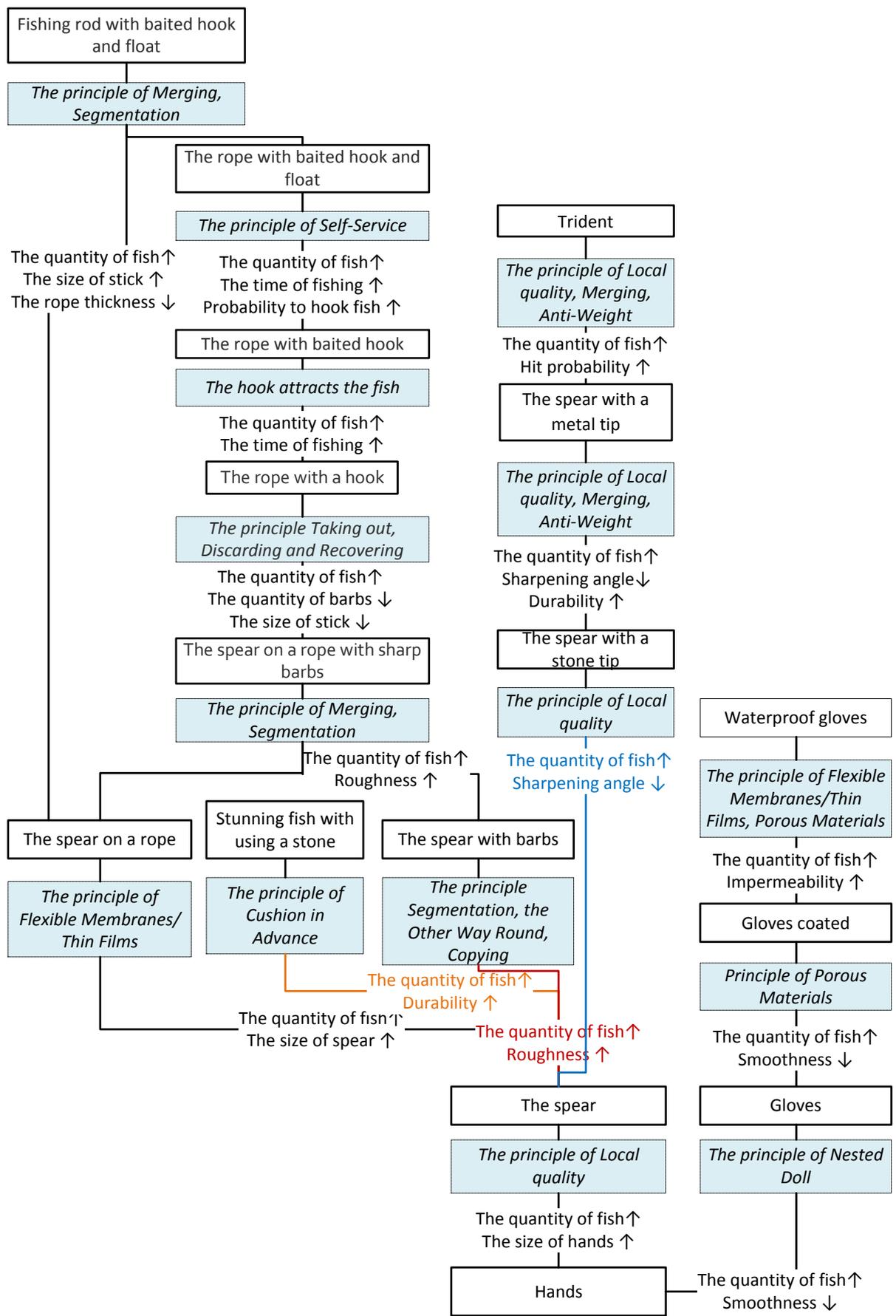


Fig. 1 - Scheme of the evolution of fishing techniques

Lenok is the genus of freshwater fishes from family of the salmon. It is widespread in the rivers and the mountain lakes of Siberia and the Far East.

The method of fishing for the Lenok are: on the fishing gear, on the live bait, the spinner, mouse, wobbler, popper, crouler. The artificial mouse is a bait for catching trout and lenok. The principle for production of this bait is based on imitation of floating mouse who got away from a cool slope or from the tree which hung over water and floated to the coast.

Contradiction is: for increase in quantity of the hooked fish, unacceptable become complicated the bait. We propose to solve this contradiction in using the principle of Nesting doll and we get a solution: the mouse with motion sensor (fig. 2). Motion sensors will help to capture the fluctuations of the fish movement when she tries to stun an artificial mouse.

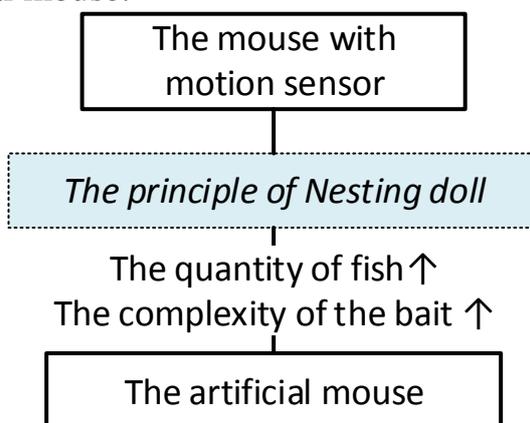


Fig. 2 - Mouse bait

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STERILIZATION BRACES CASE

1. Introduction

As a result of a survey of personnel managers at Job Site, Appearance of the interviewee, in other word, The first impression is that it has decided to the entrant or not in employment. Actually, a personnel manager of large company said “interviewee who do not manage the appearance, will probably not self-manage”.

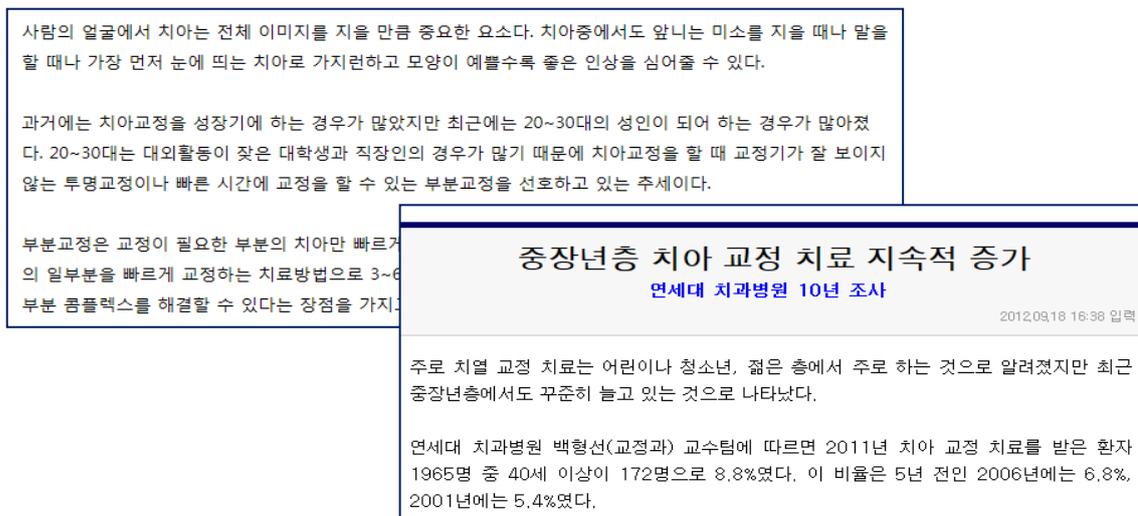


Fig1. Ongoing orthodontic Treatment demand increase article

Figure 1 – Ongoing orthodontic Treatment demand increase article

Based on the data, such as these articles, Orthodontic therapy patients is an adult and is constantly increasing, also, It is determined that the demand is gradually increased, So After Orthodontic therapy, We needed retainer to maintain Orthodontic teeth, for this reason, We have recognized the need for improved device than a being used device for sterilizing the retainer

Research method. 9-window, CECA through Theory of inventive problem Solving (TRIZ), Analyze the root cause and cause the results to the current situation, and makes a ideal (perfect) solutions. after we have defined the IFR, derived solutions by using the resources

2. Problem Analysis. Present situation. (1) Undesirable situation

A retainer is exposed in the mouth or in the air. It also contacts with water, food, and even bacteria. The result of the followed actions can terribly cause diseases and bad side effects in mouth. bacteria multiply when the retainer is not used – the place where the dental retainer is usually attached or detached such as in a restroom or a restaurant.

(2) Operating Zone, Operation Time

Operation Zone – when detaching Retainer;

Operation Time – the time when detaching Retainer.

(3) Root cause

When detaching the retainer, because of the bacteria are exposed to air, being infection and multiplying

Cause and Effect

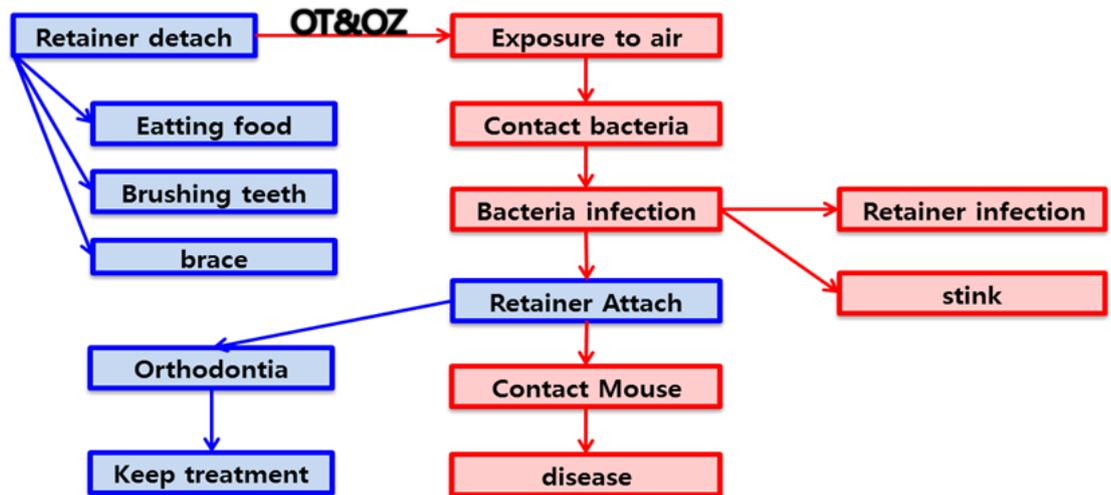


Fig2. CECA – Cause effect chain analysis

Figure 2 – CECA: Cause effect chain analysis

3. Solution deduction. Resource and IFR

(1) Existing system

Not portable: too bulky and heavy.

Need an outlet to get power to turn on.

After the device used, it needs to be washed.

Need a large amount of water to operate.

(2) MATCEM

Electromagnetic – UV : The sterilized by exposing the brace to UV.

Chemistry – Dioxide Titanium : the Photocatalys roles, enhance to UV to reduce multiplying bacteria.

Mechanical – Braces Case : The blocking contact with the bacteria.

(3) Solution

we use Ultra violet, titanium oxide and portable carrying case.

It is coated with titanium oxide in a portable carrying case, equipped with a UV lamp placed in a holding device. When this case is not used, the UV lamp is activated to sterilize.

(4) Contradiction

Good result that using UV for sterilize retainer but take out the retainer to case, cause skin damage.

4. IFR and Evaluation



Fig3. Existing device for sterilize

Figure 3 – Existing device for sterilize

We use Ultra violet, titanium oxide and portable carrying case. It is coated with titanium oxide in a portable carrying case, equipped with a UV lamp placed in a holding device. When this case is not used, the UV lamp is activated to sterilize.

Mirror : aesthetics management & Reflect UV lamp.

UV lamp : Sterilize retainer & Case.

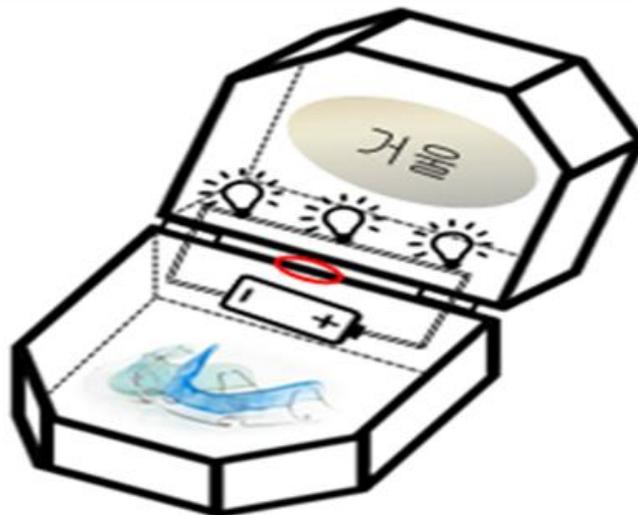


Fig4 setting devices in carrying case

Figure 4 – Setting devices in carrying case

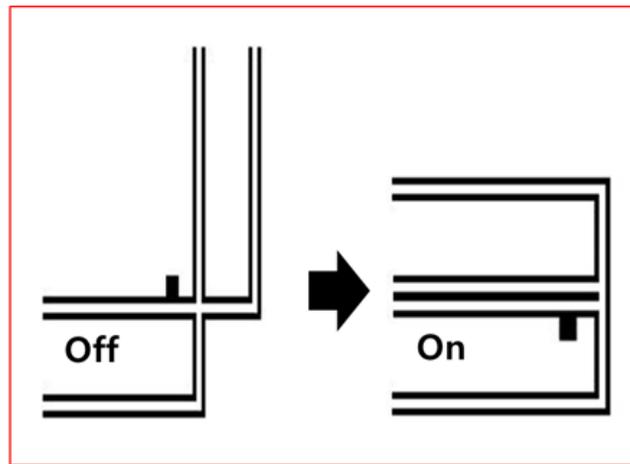


Fig5 Semi-automatic switch schematic view

Figure 5 – Semi-automatic switch schematic view

Battery : UV lamp activating & Portable

Carrying case : Keep retainer & Prevent UV exposure

5. Conclusion

The place where the dental braces are usually attached or detached such as a restroom or restaurant. Also high frequency to attach and detach the braces in daily life when bacteria multiplying occurs. We use Ultra violet, titanium oxide and portable carrying case. It is coated with titanium oxide in a portable carrying case, equipped with a UV lamp placed in a holding device. When this case is not used, the UV lamp is activated to sterilize.

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HEADPHONES

The paper consist a description the problem that may occur when using headphones and their solutions.

During long time operation wire around the plug often damaged and break, resulting in loss of sound. Although the cliff is exposed and other portions of the wiring within the plug and the speakers, this problem occurs most often. Quite often it happens so that the plug may break. The reasons that bring broken wires is a frequent unraveling, a large mobility of the wires in the plug area, and frequent operation of pulling out the plug from the socket. Headphones would cost 10 rubles per a box, then the problem wouldn't be. But in view of their relatively high cost and frequent failure for the banal reason of wire breakage, the solution to this problem becomes urgent. Actually, if you look a bit wider, this problem is not specific to headphones, and chargers. The owners of gadgets from Apple are often faced with this problem. And in simple household appliances break near the plug often occurs and could cause a short circuit, which in turn can cause fires.

The idea of solving one of several problems described.

Information search showed the following solutions:

a) the plug is made of aluminum (and not plastic, as usual), sheath wire fabric, it is hidden under the braid of wire metal mesh, which increases the strength of the wires;

b) some manufacturers have simply increased the insulation thickness of wires;

c) a drastic solution is to switch to wireless headphones;

d) a self-soldering connector and dangling wires;

g) to prevent kinking at the ends, before the connectors, put two silicone pads. Thanks to them to bend the cable simply will not work.

My solution:

a) use a "rubber cord", which can take up to 700% of its original length.

b) manufacturer of quick change plugs on, how do the connectors for the telephone line and twisted pair cabling. To eliminate breakage can also manufacture the connectors that connected the two parts of the wires.

Formulation of technical contradictions.

Increasing the thickness of insulation only delays the time of occurrence of this problem. The use of aluminum plugs and reinforced insulation entails, rather, the appreciation of the object.

The transition to wireless headphones is also not a panacea. This vehicle uses transmitters which would entail additional energy consumption for the source of the sound. As for the receivers, i.e. headphones, you will always be charged. And extra batteries will require proper operation and maintenance charge, the timely replacement. So complicated and the object itself, because it will be a whole

set of electronic components that can fail. And today the size of the transmitters and batteries are such that their size is comparable to the size of the sound source (cell phones, music players). Having solved one problem, got a few other.

Self-soldering of the plug, which is sold in the shop of radio components, or simply a patchwork of dangling wires will require someone who is engaged, certain tools and equipment and time. You can find shops that will take the job, but the price for it is likely to be comparable to the price of new headphones.

American scientists have been quite simple and clever: a hollow flexible tube of ultra-flexible plastic and filled with liquid indium-gallium alloy. If the tube is stretched — stretched and a conductor without breaking the contact, and easily transferring stretching eight times their original length.

For all its simplicity, this approach still has not been implemented in practice, and attempts to obtain tensile and elastic wires, as a rule, went on the introduction of electrically conductive materials in flexible substrate or the two desired properties in a single material. In this case, the researchers gave the elasticity at the mercy of one material, and the conductivity is different, having excellent characteristics and one by one, and using another parameter.

Such tensile wire will be useful not only for headphones but also for the chargers, and as part of the advanced flexible electronic devices and circuits. However, first, as recognized scholars, they have to cope with a serious problem: a leak of liquid from the flexible wire tube. And there is another big factor that will hinder the development of this decision – the price of these metals (indium, gallium) is quite high.

The smart quick-change plugs may seem like the perfect solution. But not so simple. Those who worked with connectors for telephone cables, on the basis of which the decision was coined, you know. That this operation requires effort and a certain tool. In addition, the cable for crimping operation to be prepared. Preparation is the removal of insulation, the arrangement of the wires and adjust to the same length.

Resolving disputes using inventive principles.

In the case of the idea of stretching wire, you will need to solve several problems. And if one of them (the price of indium and gallium) fix is unlikely to solve the leakage problem of the Explorer you can use the method of using flexible shells and thin films and the principle of partial or excessive action. This would be to use very flexible tubing. And the thickness can be increased to increase the tensile strength. As well you can take the principle of Association, for this use a silicon cover, which will increase the strength in the area of joints.

If you use quick change connectors need to solve a few problems. One of them, the availability of special tools, which will be compressing. Another, preparing the wires and laying in the correct order to connect. To solve this, you have to use the self-service. That is, when buying a connector, withal have to go ticks that would have fulfilled the function of Stripping, and crimping wires. Mites can be combined with a memo, that is, they apply the information, in what order should the wires go. But with little effort and the use of the principle of universality, of these ticks, you can get the keychain and nail clippers.

That is, buying the set, we get not only the ability to restore the headphones, but the chain with pliers. And in the future, having this keychain pliers handy, you will cut your nails and buy simple kits with connectors (without mites) for headphones repair.

OUT OF DISCONNECTION EARPHONE: PREVENT DISCONNECTION

Recently, more and more people hear the song on the road. But, we have disconnected own earphone in a daily life. And such a situation is inconvenient. So We were trying to make does not break earphone.

Using the TRIZ method in order to solve this problem creative. As a method of TRIZ, there is a 9-Windows, Fish bone, 40 Principle of the invention and IFR(Ideal solution).

We have to prevent the earphone single line, had wanted to meet the expected effect in the earphone life. In order to prevent a single line, it must be a problem situation analysis. To determine the single line cause, when disassembled broken earpiece mainly occur is broken at the connector portion, it happened disconnected at an intermediate portion stood otherwise. Single line of the connector portion as it was generated broken line, the single line of the intermediate portion stood was estimated to be generated by the problem during storage. As a result, the people were the same whether the survey and why that thought it was inconvenient.

Asked whether there is that the sticker panel has been breaking, questions of the questionnaire are as follows.

1. Have you ever been disconnected the Earphone?
2. Which part?
3. Have you ever been solving problem in person?
4. How solve the problem?
5. You can buy this cost?
6. What is the incommodity?

We have statistics by gender and age. Female is 73%, Male is 27%. The 20's is the highest rate. 82% of people with earphone disconnected experience, the most answer is connector. This result was as our thought and we decide to improve it.

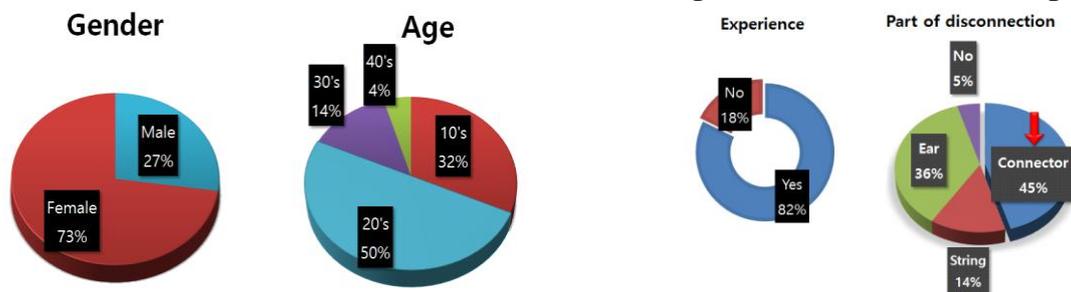


Figure 1 – Date of statistics

To analyze the more serious, 9-Windows was using one. When we insert the earphone, we choose the connector shape 'ㄱ' because of pressing the strength. When we insert and separate the earphone, we install the part of folded string be-

cause of reducing the stress. When we separate the earphone, we cut down the strength that use embossed carving & engraving because when we pull and separate earphone, it has large shock.

We tried to solve this problem with small people. When you keep the earphone in the past, stress is caused by the earphone folding. To solve this problem, that it is making a curvature on a portion broken small people in the future, it has been solved. This was the intermediary of a spring after. And when we separate the earphone to machine in the past, it takes disconnection because of shock. To solve this problem, when a large person inserts or separates connector, a little person makes curve to prevent slide. This was the embossed carving & engraving after.

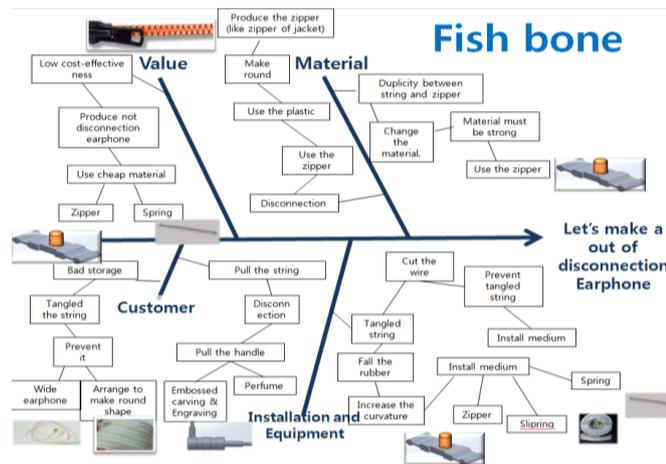


Figure 2 – Fish bone

Fishbone is the aim of this approach to derive solutions find out what the root cause of the problems found in each category. Theme is “Let's make the earphones should not disconnection.”

We categorize Value, Material, Customer, Installation and Equipment.

The matter is low cost-effectiveness in Value category. We make not disconnection earphone to solve it. As a next step, we use cheap materials to reduce the price. Finally, the solution is zipper, spring in Value category. In this way, we find the root cause of the problem in turn solved it. The matters are disconnection and duplicity between string and zipper in Material category. In order as before, we have derived the following solutions to resolve the root cause. Producing the zipper like zipper of jacket is solution in Material category.

Customer and Installation and Equipment were obtained by solving one by one. Wide earphone, arrange to make round shape, embossed carving and engraving, perfume are solutions in Customer category. Zipper, slipping, spring are solution in Installation and Equipment category.

We can find solution using 40 principle of the invention.

If number 16 (Durability of still object) is improved, number 13 (stability of object) is disturbed so we choose solution, number 35: properties transformation next solutions is same way as before.

Improve: 30: Action of object harmful factor(stress prevention) 11: tension(tension gap of rubber and line) disturb: 37: complexity of control difficulty to prevention) 36: complexity of equipment (Be complicated put materials into line) choose: 40: mixed materials 1: division(divide part and part space put into spring< new something>)

Prevent disconnection

Ideality= Spring, Zipper, Normal earphone, Connector

It is suitable using longer and high cost effectiveness. Spring and zipper are very cheap materials, too. So it is almost close to ideality

As follows this expression.

The size of the spring has been made very small for install in earphone string.

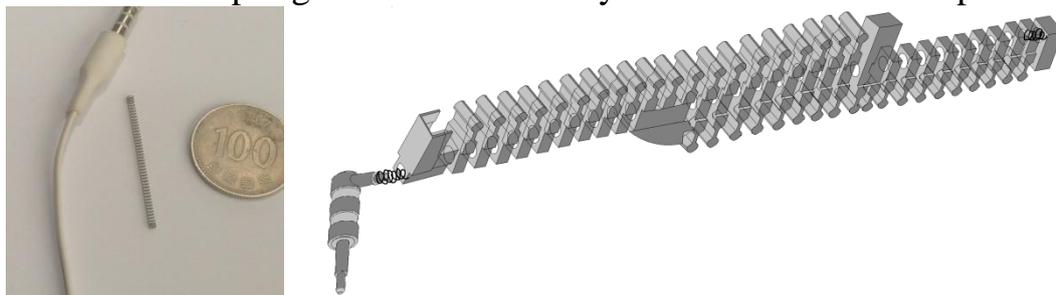


Figure 3 – Schematic diagram of the part except

The figure above is a schematic diagram of the part except the part in forked when unrolled string. We used embossed carving & engraving and ‘∟’ shape in connector. And we installed spring in between connector and earphone line and the aliquot part in forked. We used zipper the rest part.



Figure 4 –Final solutions

To prevent the joint twist between connector and earphone line , we install spring. To prevent slide and decrease strength when we install and separate connector, we use embossed carving & engraving. To Prevent to twist string, we install Zipper(fixed shape).

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INFORM THE EMPTY SEATS OF A CAFE

1. Subject

1.1. Background (Why do they need application?)

We can experienced that, when we go to there, the cafe's seat was full. then, we have to move for another cafe for the empty seat. it is no matter, if we want to seat any position. But we want to 5~6 person's seat or want to charging of computer, we are get in trouble. So, we start to this problem.

1.2. Target (This application who's need for?)

This problem's target person is active and busy modern man. Among the young customer to use a coffee shop. Is called them 'Coffice'. They visit the coffee shop. Because they want to drink coffee with do the work. What they needs is? That is, they want to not visit the shop and they want to know if you have any empty seats in the coffee shop. Summing up, for problem situation is before visit the coffee shop, in this place, want to know the cafe's empty seat. when we go to the café. we don't want to know that there is no seat in the café.

1.3 Needs (What is the need for them?)

Summing up, for problem situation is before visit the coffee shop, in this place, *want* to know the cafe's empty seat. when we go to the café. we don't want to know, and *that* there is no seat in the café.

2. Ideal solution

2.1. IFR (Ideal Final Result)

Ideal solution is the smartphone to find out where his seat in the café. Therefore, send a position information at a cafe on the platform app. Regardless of their position or distance by presenting this information on the smartphone Cafe connect users with space information.

2.2. Physical Models

If you look at analysis the physical models, you can define S1 is empty seats café, S2 is café customer. But Vacancy information store cannot directly deliver to the cafe customers. Therefore you can define S3 is application. Vacancy information is be passed on to the cafe customers through the application. At this time, field is an electromagnetic field.

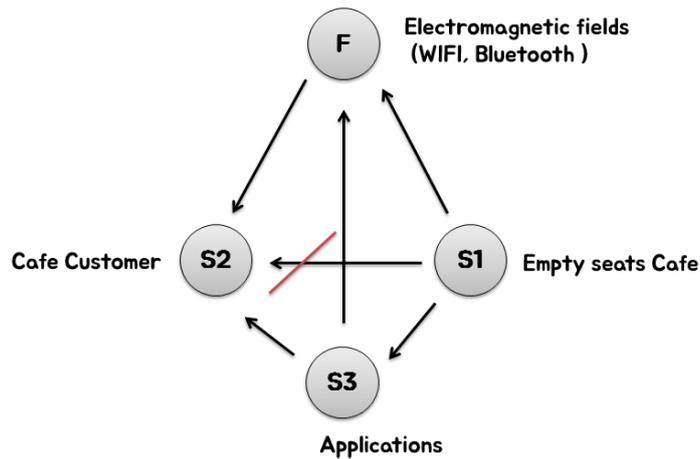


Figure 1 – Physical models

2.3. Solution estimation

Specifically To transfer to information to app, Way necessary to check the position of the cafe. We can use smartphone's Wi-Fi. The solution is to a Wi-Fi network smartphones. Although there are several ways, including attaching sensors on the chair, it is the most economical and rational thought of the way.

Most young people visiting a café use smartphones to visit a café. They also use Wi-Fi in my cafe with a smartphone. To check on seat our target is people using Wi-Fi. But there is other problems. How do people who did not use Wi-Fi on smartphones in the cafe check the place?

This is solved by providing information about the place for customers through cctv. It is an invasion of privacy if you show the cctv directly to customers. Therefore, we thought the way keeping a personal exposure and using the cctv.

2.3.1. Technical description

(1) WAASUP

We did a technology research. Actually WASSUP is new technology. We find WASSUP figure by customer's pattern of movement and location through Wi-Fi user. If the technology could apply to the cafe it is possible to verify the location of a customer as WI-FI..

(2) Face-blurring

As the way to utilize cctv, we can use face-blurring algorithm that Google develop. Recognizing the complexion and skin tone when processing blurring, it gives customer to information of empty seats.

3. Conclusion

3.1. Process diagram

Process diagram see the result the last briefing. as guests in a cafe catch Wi-Fi to mobile phones we can know seat information utilizing the technology WASSUP. If you do not use Wi-Fi or no smart phone, through handling of the cctv blurring, you can take the information of empty seats.

Process diagram

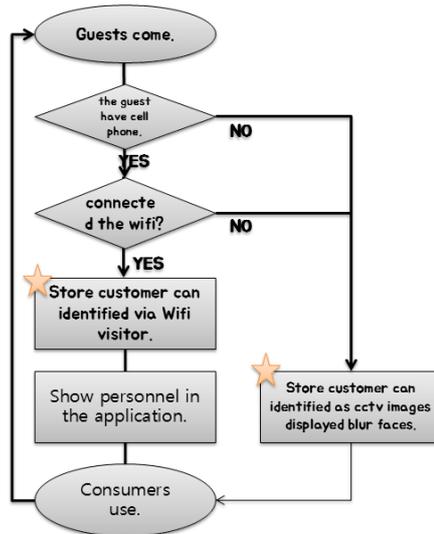


Figure 2 – Process Diagram

3.2. Prototype

Finally, This is our prototype of the application.

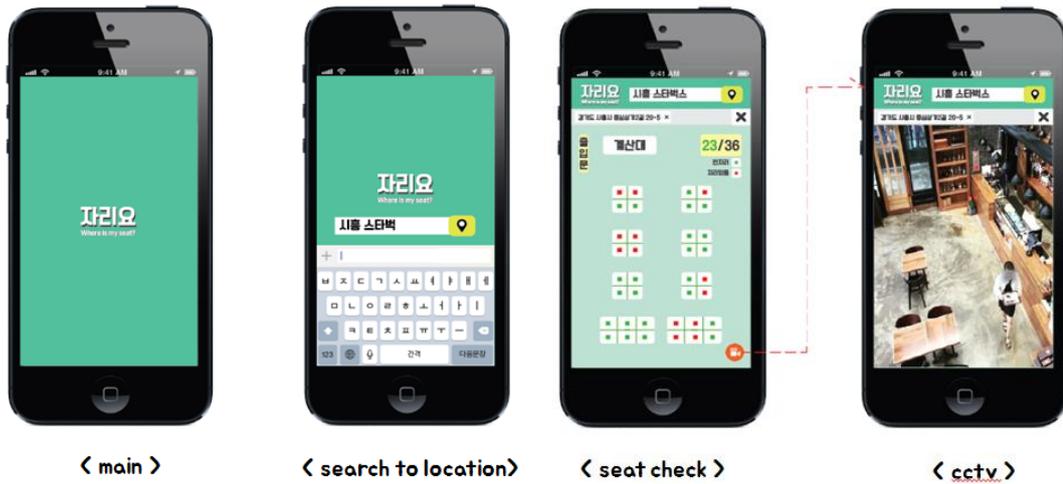


Figure 3 – Prototype

TRIZ EVOLUTIONARY ANALYSIS OF STATISTICAL METHODS

Today there is a very wide range of the variety of statistical studies. But I wanted to give a more detailed explanation about economic statistics. Economic Statistics is a science branch, which studies the quantitative aspect of different mass economic phenomena and processes of people's life in accordance with these processes' quality side.[1]

The task of vacuum cleaners' sales will help us to understand how economic statistics can provide an opportunity to make a sales prognosis for following years (Picture 1). Let's imagine that 2000 is the current year and we want to calculate how many vacuum cleaners need to be bought in 2001. Let us first try the simplest method, the averages.

Year	1Q	2Q	3Q	4Q	TOTAL
1997	102	104	100	95	401
1998	145	150	152	151	598
1999	169	164	169	177	679
2000	210	216	220	204	850
2001	294	310	395	287	1286

Figure 1 - Data on sales of vacuum cleaners

The method works this way: we need to count the arithmetical mean for each year. As sales increase year by year, for the year 2001 we will buy as many vacuum cleaners as were sold in 2000.[2] Such a prognosis has a significant mistake. It turns out that we need to urgently purchase 436 thousand cleaners and pay for the urgency of their delivery. In order to reduce the calculation error we can try to calculate the average for each quarter during the year and to make purchases on a quarterly basis, but then we will have to spend time on this procedure every quarter and for every quarter, we will have to hire a person who will do these calculations. This raises two contradictions:

1. With the increasing of the prognosis's accuracy the amount of time increases in an inadmissible way, because it becomes necessary to carry out calculations every quarter.

2. With the increasing of the prognosis's accuracy the number of staff who performs calculations quarterly increases in an inadmissible way.

To resolve these contradictions let's apply the principle of fragmentation. So now we calculate the average not for each year but for each quarter during 4 years. Thus, we move on to the method of processing time series.[3] If we buy a vacuum cleaner according to the each quarter's average, we will buy 632 thousand vacuum cleaners. This is even less than in the calculation according to the first method. It

turns out that we have not solved the contradictions and also have not increased the accuracy of the prognosis.

In order to resolve the contradictions let's take into account the fact that sales during a year are not steady, in other words let's use the principle of dynamism. And for further calculations we will use both the method of the average and the method of processing time series. It will be based on the principle of association, that is, we combine these 2 methods. Thus, we turn to the index method.[2] The index method allows you to take into account the irregularity of quarter's sales when calculating the seasonal indices. And also you can make a prognosis for each quarter of the year 2001 just in one sitting. According to the calculations made using this method we buy of 1000 thousand vacuum cleaners and 286 thousand cleaners we will have to buy urgently. These results are much better. The index method helped us to resolve our contradictions.

But progress does not stand still and let's assume that we are not satisfied with the accuracy of the prognosis made using the index method, and we would like to increase it. If we are using the index method to increase the accuracy we need more input data, but we don't have this data and there is no place we can take it from. Hence, we get a new contradiction: with the increasing of the accuracy of the prognosis comes the requirement for the input data and it increases in an inadmissible way.

To resolve this contradiction, we will use the principle of the transition to another dimension. We will display our sales on the chart and try to connect this information in order to form any functional relationship. So we have a method of identifying the components of the trend.

The exponential function turned out to be the best for resolving this task. We got a regression equation and used it to make a prognosis for the year 2001. These are the results we got using these calculations: we will need to order 1069 thousand vacuum cleaners, and then 217 thousand cleaners we will have to buy urgently. Exponential regression gave a more accurate prediction than the index method.

Now, if we want to improve the prognosis by identifying the components of the trend, we need more complex approximating functions that can complicate our calculations too much, which may lead to different errors or even make it impossible to build the regression. Hence, we get a new contradiction: with the increasing of the accuracy of our prognosis, the complexity of the approximating function increases in an inadmissible way.

To resolve this contradiction, let's use the principle of fragmentation. In other words, we build regressions for each quarter, combining the first, second, third and fourth quarters of years since 1997 to 2000. This way we have a new method.

It turned out that for each quarter the most effective approximating function is the exponential one. According to these calculations, we should buy 1106 thousand vacuum cleaners. Then 180 thousand cleaners we need to buy urgently. This prognosis turned to be more accurate than the one we got using the method of identifying trend components. So we have managed to resolve the contradiction.

So we have moved from the method of the average to the method of processing time series using the principle of fragmentation. From the method of

time series, we went to the index method by using the principle of association and the principle of dynamics. From the index method, we passed to the method of identifying the trend components using the principle of transition into another dimension. And by applying the principle of fragmentation to the method of identifying the trend components we got a new method (picture 2). But this method acquires a lot of time. And I believe that it should be further developed and researched.

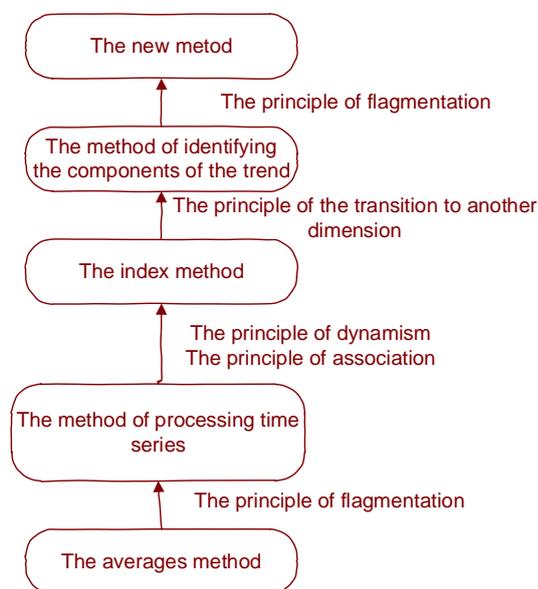


Figure 2 - TRIZ evolutionary analysis of statistical methods

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PERSPECTIVES FOR DEVELOPMENT OF AUTOMATED ENTERPRISE MANAGEMENT SYSTEMS

The paper goal is to represent capabilities of the TRIZ evolutionary approach to analysis of perspectives for development of Automated Enterprise Management Systems. Development of Automated Enterprise Management Systems is influenced by the following factors. Constantly growing competition forces executives to look for new methods of management, which allow preserving and expanding an enterprise presence in the market, increasing its profitability, and to introduce new methods of production and marketing management. The role of information technologies was thus an overriding concern. It supports all progressive management innovations. Besides, as a rule, new enterprise management approaches are initially guided by the potential of state-of-the-art IT solutions and have no practical realization without the use of computer systems. Automated enterprise management systems (AEMS) have become an integral part of the business infrastructure [1]. Due to the mentioned above it is relevant to analyze AEMS; define the driving forces of such systems evolution; identify perspective directions in their development.

To solve the described tasks we will use the TRIZ evolutionary approach. In general, the process of the TRIZ evolutionary analysis consists of the following steps [2]. *Step 1* – description of the source object. *Step 2* – identification of contradictions in this object. *Step 3* – identification of the TRIZ-tools, which helps to resolve identified contradictions. *Step 4* – description of the following objects, which resolves some contradictions. Then, steps 2-4 are repeated for all the most significant object of the knowledge field with a desired degree of detailization. *Step 5* – construction and analysis of the TRIZ-evolutionary map. The TRIZ evolutionary map is a scheme, elements of which are objects of TRIZ evolution; TRIZ-tools, which provide a transition to the next stages; connections between objects, shown by arrows.

Managing a modern manufacture includes a large number of general and specific tasks at different levels, from the management of equipment to the control of financial flows. Manageability is one of the most important criteria for any enterprise working in a dynamic market environment [1].

There are three management levels: strategic, tactical and operational, which can be characterized by the following indicators: management object, focus of management, time, and effectiveness criteria. As a rule, in modern production enterprises AEMS are applied at all management levels.

Up to 60s of XX century, the main function of information systems has been simple: interactive query processing, record storage, accounting, etc. Systems for performing these operations can be defined as electronic data processing systems (EDP systems). EDP-system can be considered as the source object of TRIZ evolu-

tion. This system has the following contradiction: with increasing volume of information to be process time for decision making unacceptably increase. Contradiction 1 was partly eliminated using the Principle of Merging by introducing a uniform data model across the organization and modules for report compilation based on different categories of indicators. Thus, the first MIS systems were created. Thus, the first iteration of AEMS TRIZ evolution was performed.

MIS systems [3] also had series of restrictions. For example, rigidly structured results of reporting systems no longer meet the requirements of management. MIS systems could not provide specialized, interactive support and decision-making in the unique conditions of a rapidly changing environment. Thus, there is a *contradiction 2*: with increasing scale of enterprise operating conditions dynamic the efficiency of systems unacceptably decreases. Besides, at the end of the 60s enterprises with lots of automation-equipped working places looked for a way to simplify the management of production processes. *Contradiction 3*: with increasing number of automation-equipped working places complexity of management unacceptably increases. Elimination of contradiction 2 led to the creation of OLAP systems. Elimination of contradiction 3 led to the creation of MRP systems [4]. Thus, the second iteration of AEMS TRIZ evolution was performed. Performing all steps of the TRIZ evolutionary analysis, the TRIZ evolutionary map of AEMS was revealed.

Analyzing the map, we can make the following conclusions. There are 4 stages of evolution: 1 – EDP systems; 2 – MRP systems; 3 – ERP systems; 4 – IAMS. Main moving forces are principles of: Local quality; Another dimension. In general, about 44 subsystems were defined during analysis. The evolution corresponds to the trend of transition to the super-system. The evolution also corresponds to the trend of enlargement and trimming.

The last stage of AEMS evolution is characterized by a tendency to merge into a single integrated automated management system (IAMS) based on technical hardware and special software that covers all management levels, including the production process management level. IAMS has a contradiction: with increasing efficiency of production management (as a result of IAMS implementation), time for staff training adaptation to new technologies UNACCEPTABLY increases. This contradiction can be eliminated by the principle of intermediary, where intermediary is an expert system.

Expert system [5] allows accumulating knowledge and updating it basing on an active analysis of technological information, including generalized experience of the design technology and results of technological researches; reacting and providing a variety of solutions for a number of tasks basing on the accumulated knowledge; learning and describing the process of decision making.

Expert systems should be integrated with hardware and software complex at the level of production process management. Such integration simplifies the process of staff training; provides a number of tools for effective decision making on the base of accumulated knowledge. The suggested solution is supposed to be analyzed by authors in more details and be tested and proved in real conditions.

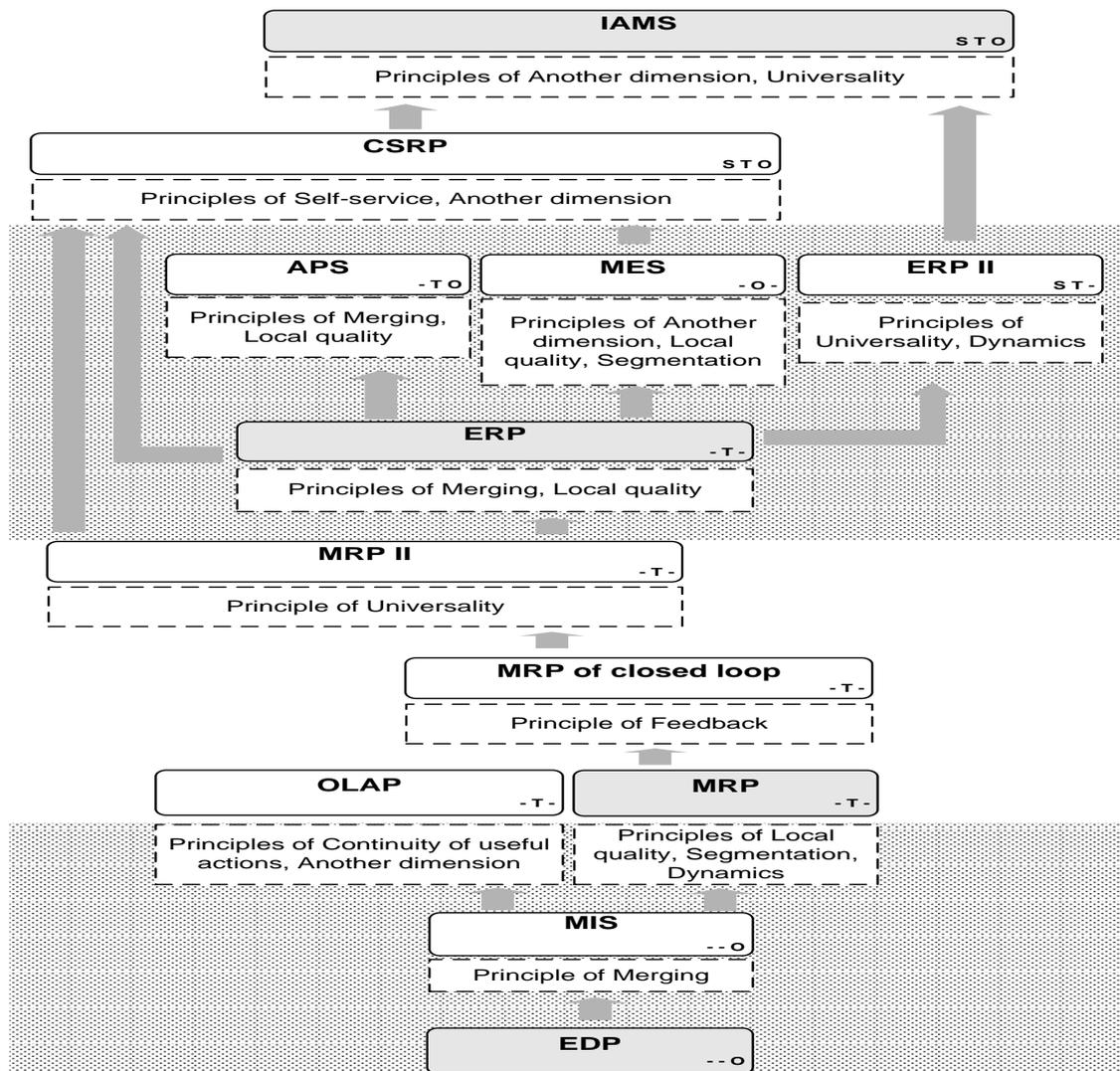


Figure 1 – TRIZ evolutionary map of AEMS

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