A Study on the Disruptive Innovation Method by Punctuated Equilibrium Theory

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1. Background of the Study

The studies on innovation have been widely conducted on searching for the necessity of innovation in business strategy, increasing the innovation capability of an organization, and investigating the innovation process in the history. In particular, the studies on the types of innovation have supported to find the direction of innovative strategy for business and market conditions. After Schumpeter (Schumpeter,1934), many scholars started to use the term of innovation as the creation of wealth by social and economic innovation while it had represented technology innovation for a long time. There have been several studies about innovation: studies about the definition of innovation(Rhodes and Wield,1994; Tien,1998), studies about the roots of inn ovation(Drucker,1993;Tidd,2002), a study about the innovation model(Maidique,1980), and a study about innovation from inside or outside of organizations(Hauschilt & Schewe,2000).

These studies promote not only the necessity of innovation but also the necessity of specific method to bring the innovation into real life to companies. However, the studies on innovation models with a process perspective only provided the process for using the capability to commercialize ideas, but failed to help companies to create ideas with actual value because most studies only conducted post hoc analysis for the results of innovation of companies. (Poter, 1990; Cooper,1998; Tidd, 2002; Amidon,2003)

Hence, most companies have depended on the existing creative thinking techniques to create values.

There are several studies on the creative thinking techniques: the study on mind map (Buzan,1974), the study on brainstorming (Osborn,1963), and the study on horizontal thinking(De Bono,1970).

Most techniques share the same assumption that more ideas from creative thinking can draw more valuable ideas. But it's also truth that most companies feel difficulties to select the best idea from them. There are also several decision making techniques such as various checklists, the Kano mod-el(Kano, 1984), the Delphi method(Norman,1963), and AHP method(Saaty,1989) to supplement the problem and to be used for assessing ideas. However, the quality of innovation

still depends on the amount of ideas and the accuracy of assessment, and this is why numerous companies have failed to create a new market even though they have desired to develop an innovative product by creative techniques.

As a result, most companies design and commercialize innovative products based on creative thinking techniques, and more than 95% of the products fail to create a new market within 3 years (Andrew J. P, 2010).

2. Purpose of Study

As mentioned before, there has been no report of a specific method even though companies have required the specific method to adapt a new and uncertain business environment, and avoid the competition with existing companies controlling the market, and creating enough innovative values to destroy the market itself. Organizations adapting the brainstorming method for creative thinking generally have some difficulties about how many ideas should be created and when they could stop idea generation process. Most companies are using the innovative process creating ideas from divergent thinking which concludes only similar ideas; the divergent thinking is proper to select some better ideas among similar ones, but not proper to innovate conventionalities and not to recognize problems. It also depends on the accidental expansion of ideas rather than considers the business value, and does not properly integrate the results of ideas and business validity.

This study researched on the theories to overcome the limits faced by companies, established a fundamental mechanism of disruptive innovation, and suggested a new innovation method to be actually used by companies.

3. Identification of Disruptive Innovation Mechanism

The study briefly examined the previous studies on the punctuated equilibrium theory in the evolutionary biology and the disruptive innovation theory in the business innovation to identify the part of products which should be innovated, and the reason and method of innovation to create the disruptive values, and approached from the views as follows to analyze the results with methods of consilience and reach a solution. Punctuated equilibrium in social theory was largely inspired from the biological theory of punctuated equilibrium (Frank and Jones 1993; Tushman & Romanelli, 1985). This theory suggests that most social systems exist in an extended period of stasis, which are later punctuated by sudden shifts in radical change. In this paper we investigate on the punctuated equilibrium theory in the evolutionary biology and the disruptive innovation theory in the business innovation

1) Punctuated Equilibrium Theory

Darwin consiliently accepted the principle of population by Malthus into biology, and revealed that the natural selection was the mechanism of evolution. However, in the 1980s, there was an announcement that there was no connection between the microevolution and macroevolution, and Gould's punctuated equilibrium was selected instead of Darwin's progressive evolution which explained the reason of evolution as the result of accumulated small changes found in fossils. In the punctuated equilibrium theory (Eldrege & Gould,1972), the macroevolution is caused by rapid changes in transcendental genes or the regulator gene critically influencing on reassignment or premature differentiation of fundamental chromosomes during certain changes such as rapid changes in climate.

2) Disruptive Business Innovation Theory

According to Christensen who suggested the theory, the leading companies desires to continuously control a market but loses their positions because a competitor introduces a product with a totally new impression, therefore, destroys the existing market, and creates a new market (Christensen, 1997).

Luke explained the market disrupting product which could provide amazing, useful customer values not by the improvement of the existing inconvenience of customers but by the improvement of conventional inconvenience which was not recognized, and maintained that only this result could create a new market, and suggested a method for creating a disruptive hypothesis as the specific method for creating a new market. He says "a dis-ruptive hypothesis is an intentionally unreasonable statement that gets your thinking flowing in a different direction" (Luke,2010).

This study integrated the existing customer understanding to find out the conventionalities with the product insight for the innovative products, and suggested a new method to extract and improve the 'cliché' more systematically

3) Consilience between Business Innovation Theory and Punctuated Equilibrium Theory

The term 'consilience' is known to have been firstly used in the 'Philosophy of Inductive Science' by William Whewell in 1840, and represented "an integration of knowledge by connecting the facts across fields and theories based on fact to create a common foothold for explanation. In other words, the inductive result of consilience is only from the consonance between the inductive result from the conclusion through a field consisting of facts and the result from another field; thus, the consilience represents to assess theories analyzing the facts which have already occurred."

In other words, the consilience represents a consonance or a consistency between inductive truths from different fields. The gene variation has already been proved as an

inductive and scientific method to explain the macroevolution mechanism in the theory of evolution; on the other hand, there is no clear mechanism for the disruptive innovation for products in business innovation. Thus, there is no method for disruptive innovation while the necessity and validity of creating a new market by the disruptive innovation have been inductively proved in the business innovation theory.

The study compared the punctuated equilibrium theory, an inductive conclusion found in evolution theory and the disruptive innovation theory, an inductive conclusion found in business innovation from the consilience perspective, and analyzed the ordered consistency in those two in <Table 1>. The results of this analysis by item are as follows.

First, when a life and a product are compared as the subjects of evolution.

Second, the natural selection which explains the selection and survival of life, and the subject of evolution in the evolutionary theory, in nature is very similar with the market selection which explains the selection and survival of the product, and the subject of evolution in the business innovation theory, in market.

Third, the life's evolutionary processes consisting of progressive microevolution and intermittent macroevolution is exactly the same as the product's evolutionary process consisting of progressive and continuous innovation and rapid and disruptive innovation.

	Evolution Theory (Punctuated Equilibrium)	**Innovation Theory** (Disruptive Innovation)
Object	Living Things	Products
Survival Condition	Nature Selection	Market Selection
Process Type	Micro/Macro Evolution	Disruptive/ Sustained
Result	New Species	New Product/Market
Cause	Ecosystem Change	Tech. & market Changing
Mechanism	Gene change	?
Manager	Nature	Company

<Table 1>Consistencies of Evolution and Innovation Theory

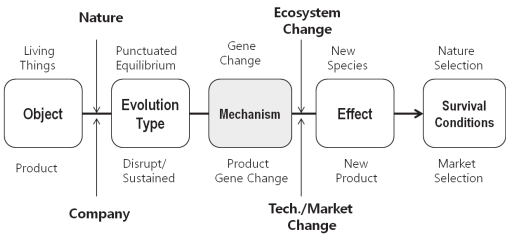
Fourth, the differentiation of new species, the result of the evolution of life, is very similar with the new and innovative product with a disruptive value enough to create a new market in the business innovation theory.

Fifth, the accidental changes in the ecosystem is the fundamental reason of macroevolution and the rapid changes in the technology and market environment are inductively proved to be an environ-mental condition for disruptive innovation.

Thus, the life and product have orderly consistencies in survival condition in evolution, the evolutionary process, the result of evolution, and the condition of evolution. In other words, the inductive study results from those two are very similar, and the knowledge can be integrated by connecting the facts and the fact-based theories across fields.

In other words, the disruptive innovation mechanism of the product can be drawn from the macroevolution mechanism of life by a conclusion of consilience analysis even

though life and the product are placed in different fields. A company which successfully understands the gene of a product can create a disruptive innovation, a macroevolution of a product, by changing the gene of the product like changing the gene of life. The [Figure 1] schematizes the above results.



[Figure 1] Business Innovation Mechanism

4) Disruptive Innovation Mechanism

Based on the above consistency, this study found the inductive truth that the mutation by gene substitution, and the macroevolution mechanism of life in

the evolution theory, could be applied to the disruptive innovation mechanism in business, the same as Darwin's adaptation of Malthus' principle of population into the evolution of life and discovery of inductive truth of natural selection.

In other words, the innovation, which is marketdisruptive and has totally new market value, can be effectively performed by understanding the fundamental nature of a product or a service(gene) and developing it for the environmental changes(gene substitution).

There is indeed a difference between the evolution of life and the product; life naturally evolves through nature, and the product artificially evolves through companies. However, this study considered the company, the subject of artificial product innovation, and the researcher, the creator of new products with artificial innovative values by mutation from gene substitution in a lab, as the subjects of macroevolution satisfying the consistency, because the breed improvement is a directed evolution for inventing a new species with useful value for humans by artificial selection, and the company's value innovation can be a type of this artificial and directed evolution.

4. Suggestion of Methods for Disruptive Innovation

A. Models and Concepts

1) Product Evolution Model

This study conducted and suggested a modeling of the following evolutionary process of the product to expand the gene (not biological but symbolic meaning) substitution of the product from the disruptive innovation mechanism to the innovation method in real life, and designed and suggested the method.

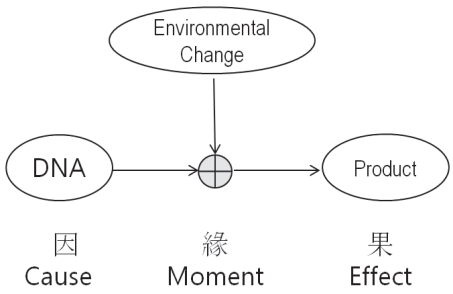
The suggested evolution model of the product consists of three elements shown in the following [Figure 2]: the existing product including functionality, specification, and gene which is the nature of a product, the environmental changes to trigger the evolution of an existing product, and the evolved

product after the integration of the previous two by a company, the subject of the innovation.

In this paper we use symbolically product 'gene' and product 'DNA' as a same meaning even a gene is a locus (or region) of DNA in biology.

In our model, the existing product is corresponding to the cause(因) of the evolution of the product, the environmental condition/ element plays the role of moment(緣) on the cause, and the innovated product is the effect(果) of the dependent origination.

With our suggested model, [Figure 3] shows how to explain the direction and size of the influences of environmental changes

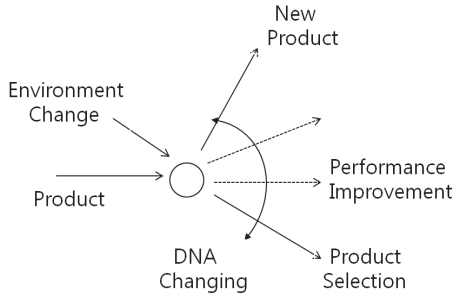


[Figure 2] Product/Service Evolution Model

on the gene can be modeled to control the selection of the species of the product and the birth of a new species.

2) Definition of Product Gene and Product Insight

The DNA of life is a fundamental property which will never disappear from the interior of a species during the evolutionary process and maintains the characteristics of a species, or the fundamental attribute of the birth of life which is maintained from birth to death. In other words, the DNA of a product is a fundamental attribute which is contained in its appearance or function but maintained even though the appearance or function is changed. Thus, the DNA of the product is a fundamental attribute which can be found from both the product of the past and the product of the present.



[Figure 3] Changes and Evolution of DNA

This is an attribute similar with 'cliché' provided by the method to create disruptive hypothesis which is suggested by Luke (Luke, 2010) but it is more fundamental and continuous, because the degree of innovation by the disruptive innovation is relevant to the degree of fundamentality of the changed attribute. Unfortunately, There is no specific method to find the 'cliché' in his suggestion for a disruptive hypothesis.

Thus, the discovery of the DNA of product is identical with the discovery of the fundamental attribute of the product; this process is named as 'product insight' in this paper. This concept is in contrast to the attempt to gain an insight into customers and

discover the customer value through the emotional mapping of customers in the existing business in-novation and the design theory(Lockwood,2010).

This study suggested a new method called 'product insight' to overcome the limits of customer insight, and explained the detailed methods of product insight in the below insight matrix.

3) Definition of Element of Environmental Changes and Environmental Insight

The intermittent macroevolution of life is appeared during the changes in genetics by rapid ecosystem changes. Thus, the element of environmen-tal changes for product evolution in this study can be defined as the subject of external ecosystem changes which can influence on the evolution of a product. This element of environmental changes consists of physical elements including technology influential in the product gene and emotional ele-ments of customers in the market.

The physical elements represent technologies and materials applicable to product innovation and other products with similar genes. The emotional elements of customers represent the elements controlling over the recognition of customers such as lifestyle and customer needs.

In the process of discovering the customer values, the element of environmental changes represents the process of discovering the influential elements on the gene; this paper named it as an 'insight into the elements of environmental changes'. The best evolution of the product represents that the existing product has evolved under the influence of the elements of environmental changes different from the time of the birth of the product. In other words, it is necessary to investigate into the elements of present or future environmental changes influential on the product evolution for the evolution of the existing product. This study names it as an 'environment insight' for differentiation from the emotional elements. The study does not provide a detailed explanation about the element of the emotional changes of customers because it represents the 'customer insight', the discovery of customer needs which has been used for existing theories and designs. (Lock-wood,2010)

4) Insight Matrix

The key of the methods in this study is an application of the results of customer insight not for the improvement of the function or specification but for the gene, the result of product insight, to be differentiated from the existing design methods and must perform a fundamental innovation. The <Table 2> shows our suggested matrix relationship between 'customer insight', 'product insight', and 'environ-ment insight'.

Customer insight has been focused on finding the customer needs(pain & gain) to discover the customer values. This study applied this to the suggested product evolution model, and newly analyzed the relationship

between customer insight, product insight, and environment insight.

Cause	Moment			
	Environment Insight	Customer Insight	Environment Observation	Customer Observation
Product Insight (Properties, Gene)	Disruptive Innovation		Sustained Innovation	
Product Observation (Function、Spec.)	Effect: Sustained Innovation			

<Table 2>Explanation of Customer /Product/ Environment Insight

In other words, the application of predictive information about customer needs from the 'customer insight' method or new technology from 'environment observation(not insight)' to the improvement of the function or specification observed from the external factors of the product would make a new sustained innovation of the products. On the other hand, the application of the result of environment insight or customer insight to the gene, and the fundamental attribute of the product, by product insight should create a new disruptive innovation of the products.

There is a little specific explanation about the relationship between the process drawing customer needs and the product which is the subject of changes in the design theories, and the subject of customer insight performed in the service design or the design thinking has been the observation about the function and specification of the product/ service. As a result, the continuous or progressive innovation rises rather than the disruptive innovation.

This study expanded the existing methods focusing on customer insight to casual structure, discovered the significance and role of product insight, revealed the relationship between environment insight including technology and product insight, and organized a new structure of innovative methods for product innovation.

B. Proposed Methods for Value Innovation

The steps of process using the insight matrix mentioned above, changing the fundamental attributes of the product, and innovating the values of the product are as follows.

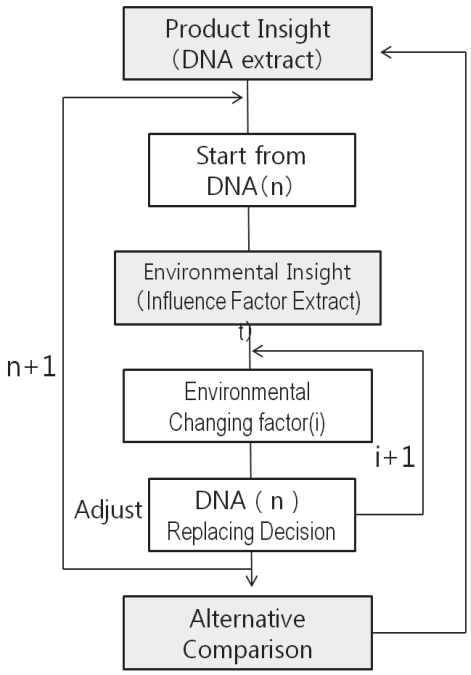
The first step is the extraction of DNA of the product/service by product insight.

The second step is the identification of elements influential on the environment by environment insight.

The third step is the design of the matrix with extracted DNA and influential elements on the environment, and the inference of DNA changes through the relationship between environmental elements and DNA elements.

The fourth step is the design of new products/services due to the DNA changes in the third step, and the selection of the best alternative after comparing the products/services.

This method is designed to focus on the space for releasing the existing indefinite ideas on the key space consisting of the fundamental elements of the product and environment and thoughts. The details by steps



[Figure 4] Proposed Process for Value Innovation

which is shown in Figure 4 are as follows.

1) Extraction of Gene by Product Insight

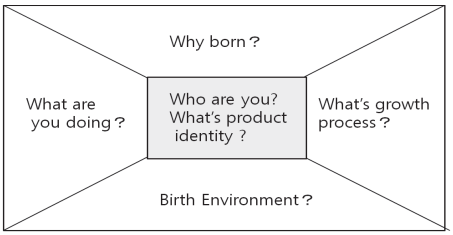
The product insight is a process to understand the fundamental attribute of the product or the identity of the product like the inner pain and vision of the customer are understood by the observation of the customer's words and actions through customer insight. This study proposes two methods for the process as follows.

A) Guidance on Product Insight

The understanding of the fundamental attribute of the product is the same as the discovery of the identification of the product. An interview can reveal the fundamental information which cannot be found from one's resume. In other words, using similar questions in the interview can help with the comprehension of the fundamental attribute of the product or the conventionalities which customers easily ignore. The following [Figure 5] uses guidance on product insight and gives directions as follows.

First, it is necessary to question about the reasons of the birth of the product and the environmental elements for the birth, and investigate the background of the birth of the product. This is not a process to simply collect data but a process to track the view of the innovator who firstly created the product. The purpose of this investigation is to reclaim the fundamental purpose of the innovator who first-ly created a product; it was lost from the focus of improvement during the continuous performance evolution.

Second, it is necessary to investigate the growth path used by the evolution of the product. This process helps with investigating the elements influen-tial on the growth and discovering the reason for the current shape of the product.



[Figure 5] Guidance Map on Product Insight

Third, it is necessary to organize the function of the product based on the information from above for leading entrepreneurs to summarize the fundamental attribute of the product.

B) Analysis on Product Analysis Diagram

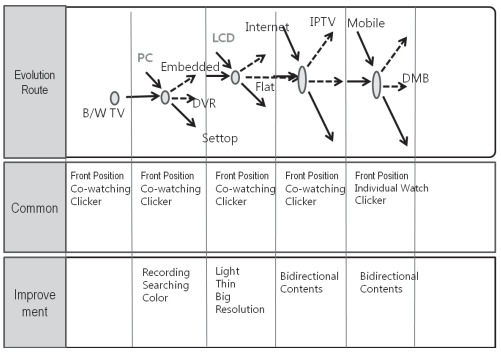
The DNA of product/service, as mentioned above, is a fundamental attribute which has never changed and is maintained during the product/service evolution. Thus, the DNA can be extracted by investigating the product in the past and the present and analyzing a common customer value among them as follows.

[Figure 6] indicates the example of TV. The TV has constantly evolved from the black-and-white TV, and the contents distribution methods have also changed from public TV network to cable and internet. The screen has evolved from black-and-white to color, and it has become lighter, thinner, and bigger. The resolution also has been improved, and these evolutions are included in the performance evolution by technological improvement. During these constant performance evolutions, the key attribute of the TV which stands in front of people and is remotely controlled to display the contents has been maintained without any change. It is the conventionality remaining in the evolutionary process of TV, and various technological improvements have not improved these attributes but have been applied to the improvement of various functions and specifications.

The innovation in this study focused not on the improvement of the function or specification due to the technologybased innovation but on the gene from the insight into the fundamental attributes of products.

2) Method for Investigating Environmental Changes

The elements influential on the environment consist of the elements of physical changes including technology which can have an effect on the product evolution from environment insight and markets for other products, and the elements influential on emotions from customer's cognitional space obtained by customer insight. The environment insight analyzes the environmental elements at the time of the birth of the product, and compares this environmental element and future environmental element, and concludes a change.



[Figure 6] Evolution Map for DNA Extraction

The key physical elements relevant to the product should be selected at this point; generally less than 5 elements are selected for convenience. Other key products which are now changing rapidly and having similar genes with the subject product should be listed with their attributes in the elements for other products of the elements influential on physical changes.

The elements of customer's cognitional space consist of lifestyle, customer needs,

and others which can use the pain and vision of the customer from customer insight. In other words, the investigation of elements influential on environmental changes is the result of environment insight and customer in-sight. This study proposed to use the existing methods of customer insight developed from the design field, and did not separately mention it.

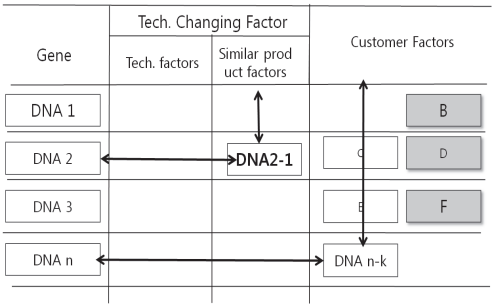
3) Method for Substituting Gene

Companies which lead the innovation through systematic investigation into the relationship between extracted DNAs and the elements influential on the environment can predict the direction of DNA changes which can provide totally different cus-tomer values from the existing products. The matrix in this study designed the following [Figure 7] after the concretization of disruptive innovation based on the inductive explanation of customer/ product/ en-vironment insight in < Table 2>.

In other words, the DNA substitution needs the following conditions.

First, it is necessary to vertically list the elements of extracted DNA and horizontally list the elements influential on the environment.

Second, it is necessary to link the elements of DNA with the elements influential on the environment and look into the changes in DNA elements by the elements influential on the environment and the customer values from these changes.



[Figure 7] Product's DNA Substitution Matrix

Third, it is necessary to provide indexes (DNAn-k) to the elements with the DNA changing possibility.

Fourth, it is necessity to substitute the elements with the possibility to change DNA, DNAn-k, for the existing genetic elements, DNAn, and select the DNA set with the most customer values.

This process is a type of mindmapping or brainstorming to draw up the fundamental attributes of the product, the subject of innovation, apply it to this process, select skills, similar products, customer needs, and others with changeable attributes, and sequentially connect them. However, the proposed methods are not ideas dependent on divergent thinking about the function and specification of the product, but the development of limited brainstorming only for the fundamental attributes of the product; this is not a divergence but a process of think-ing limited to the inception of the fundamental attributes.

5. Cases Study on Disruptive Innovation

A. Case Selection of Disruptive Innovation

Christensen explained the characteristics of disruptive innovation as having less performance and a cheaper price of the initial product. In most of the succeeding studies, this classic definition has been used to find out whether a product is disruptively innovated or not.

This study selected the following 3 representative disruptive innovation cases to prove the validity of explaining the methods proposed in this study not with the classic definition but with perspectives to overcome the 'cliché' of the product and create new customer values, and indicated that these cases can be systematically explained by the methods proposed in this study.

The selected cases include not only the cases already accounted to be disruptively innovative but also the cases which satisfy the classic definition of disruptive innovation but fail to adapt to markets, and indicate the possibility of the methods proposed in this study to explain the reasons of the failure. The cases also include the representative cases which do not meet the classical definition of disruptive innovation but is accepted as disruptive innovation, and indicate that the methods proposed in this study can explain the cases unexplainable by the classical definition.

B. Explanation for Cases

1) Case 1: Cases Satisfying the Classic Definition but Failing in Market: IPTV

IPTV is a new and innovative product evolved from the existing TV. Many companies have participated in the development of IPTV due to the expectation for its potential; its concept was recently advanced to the Smart TV, and has created a new market.

However, IPTV is considered to have failed or be facing a tough time in creating a new market. In other words, IPTV realizes two way communication which the existing TV does not have, and is considered as a disruptive innovation. However, it has failed to be selected in the market because of the lack of contents.

This study analyzed IPTV to 'cliché' of TV and create new customer values, reexplained its innovation process, provided the reason that it was con-sidered as a disruptive innovation, and indicated that the reasons of its failure could be explained by our proposed method in this study as follows.

A) Product Insight

Since the birth of the first black-and-white TV, it has evolved from black-and-white to color, and its specifications have also been improved in resolution, size, thickness, and others. However, fundamental attributes have also been sustained during the evolution. People have always put the TV in front of them, shared one way contents from it, and controlled it from distance. Thus, if we applying the definition of suggested methods these are considered to be the genes of TV and also 'cliché' of TV which nobody did not feel any inconvenience and tried to change.

B) Environmental Insight

The element influential on environmental changes for IPTV is the internet; in other words, IPTV is an innovative product from the integration of the TV and internet, the element influential on environmental changes.

C) Gene Substitution

The genetic changes in the existing TV can be explained in a gene substitution matrix shown in [Fig-ure 8] as follows.

It is positioned in front of people(gene1), watched by all members of a family(gene2), controlled from a distance(gene3), and provided by TV stations with one way contents(gene4). The internet, an element influential on environmental changes, added a new genetic element, the two way content. Thus, the gene4 of TV was replaced with the new gene, two way contents.

D) Failure Analysis of IPTV

There is a new explanation on the problems of IPTV from the perspective of gene substitution.

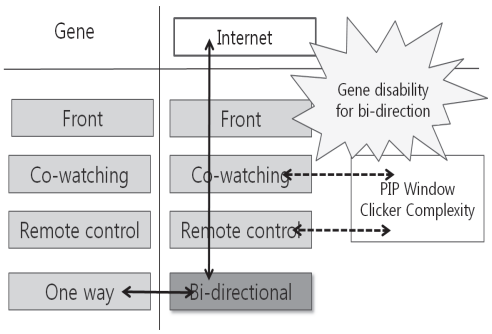
IPTV was designed to display a PIP box on its screen and show separate communication and payment windows to apply the bilateralness of the internet to TV(gene4). But it maintained the gene1 and 2 that TV was generally positioned in front of people to be watched, and added the two way communication by the PIP box. However, the PIP window on the TV screen interrupted others who were watching TV and limited the gene2, watching TV with others; in other words, there was an irony in the realization of the new gene4.

It also added a complexity on the remote controller which had evolved to simply control TV, and limited the gene 3; and, as a result, it brought a new irony, the inconvenience of two way interface.

In other words, IPTV disruptively innovated the TV with technology integrating the internet and TV and transforming the existing one way provision of the contents, gene 4, into a two way thing. However, this substitution of gene4 influenced on gene2 and gene3, and as a result, created a recessive mutant.

The IPTV satisfies Christensen's definition of disruptive innovation from nonconsumer which is less performance and a cheaper price of the initial product. We show our proposed method could systemically explain why it is a case of disruptive innova-tion and why it is fail to open new market.

2) Case 2: Cases Satisfying the Classic Definition and Succeeding in Market: Social TV



[Figure 8] Explanation about Gene Substitution of IPTV

The social TV, the most significant innovative technology selected by the MIT Media Lab in 2010, is known to be the most representative innovation case (MIT Technology Review, 2010). This study accepted the social TV as a revolutionary product and disruptive innovation from the perspective of methods in this paper. The results of the analysis on the innovation process of social TV are as follows.

A) Product Insight

As mentioned above, the genes of IPTV consist of its location in front of people, watching with others, being controlled from a distance, and two way communication.

B) Environmental Insight

The social TV is the result of integrating the elements of environmental changes such as mobile devices and SNS and the genes of IPTV shown in [Figure 9]; this brings environmental changes that the 2nd screen, a mobile device, and the 1st screen, a TV screen, are provided at the same time.

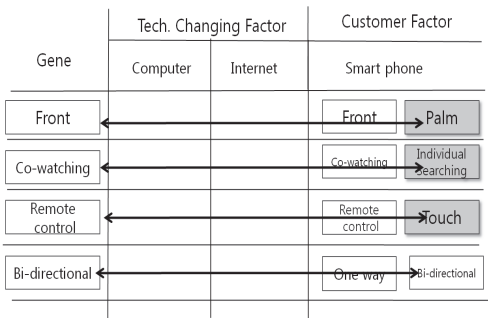
C) Gene Substitution

The social TV is an alternative to overcome the problems of IPTV and maintain the two way communication; it did not realize the two way communication of the internet on TV screen but allowed the TV contents to maintain existing gene1 and gene2 and substituted the other genes or realized the two way communication in smart phones or pads. This method can be genetically explained as follows.

The existing gene1 of the TV, being located in front of people, was genetically modified into being located in the hands of people; the gene2, watching together, was also genetically modified into the 1st screen for being watched by a number of people and the 2nd screen for individuals.

The gene3, being controlled by remote controllers, was also genetically modified into the touch system of the 2nd screen. As a result, the recessive mutant, the result of failure of genetic modification in IPTV, was transformed into a new dominant mutant.

The social TV satisfies Christensen's definition of disruptive innovation from non-consumer which is less performance and a cheaper price of the initial product. We show our proposed method could also systemically explain why it is a case of disruptive innovation.



[Figure 9] Gene Substitution of Social TV

3) Case 3: Cases Not Satisfying the Classic Defini-tion but Succeeding in Market: iPod

The iPod does not meet the lower performance or price than what users expect, the classic characteristics of disruptive innovation, but is the most representative case of

disruptive innovation to destroy the existing MP3 player market in a short time. We analyzed this case to show, that the disruptive innovation, which could not be explained by classic methods, could be explained from the perspective of our proposed method.

The following [Figure 10] explains the disruptive innovation of the iPod with the transformation of product genes, and the 'cliché' of existing MP3s.

A) Product Insight

The fundamental attribute of the MP3 market was a market selling products called MP3 players which could play music in MP3 format, consume music while moving, copy the music to computers, and be controlled by certain buttons although there had been a number of companies in the market.

B) Environmental Insight

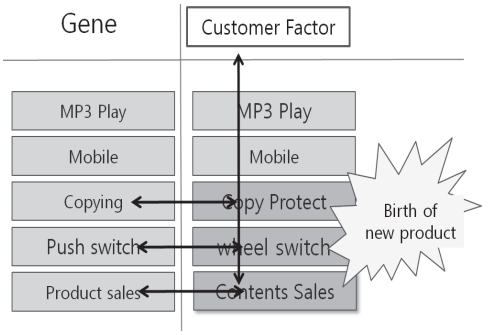
The existing MP3 users desired a more conveniently way to find various music by a faster search.

C) Gene Substitution

The gene of the existing MP3 allowed users to copy music from device to device; on an iPod, the gene is transformed into the permission of not copy but the download of music through iTunes, and it created a new market to sell various types of music through iTunes.

The iPod also substituted the existing gene or the control of the device by pushing buttons into a new gene by integrating it with the customer's desire to quickly find music, and created a totally new MP3 player.

These investigations indicated that the reason for the success of the iPod, the most



[Figure 10] Gene Substitution of iPod

representative disruptive innovation case, cannot be explained by the classical definition of disruptive innovation by Christensen, but can be analyzed by the methods in this study.

The above three cases indicate the methods and processes proposed by this study; those methods and processes are considered to be used as a method for disruptive innovation because they not only explain the existing disruptive innovation but also provide the consistent methods and directions about what parts of the product should be innovated and what methods should be used for the innovation.

6. Application Experiment for Proposed Methods

A. Design of Experiment

It is difficult to prove the usability of creative thinking techniques. It is more difficult to prove the usability of creative thinking techniques based on the quantitative analysis

because it is very difficult not only to measure and normalize the participants' degree of the understanding of methods but also to satisfy the uniformity of experimental conditions.

The usability and usefulness of the methods of thinking are also changed by the degree of harmony between the methods and user's thought techniques and characteristics; thus, it is not easy to select a more useful method based on the results of experiments even though the number of participants has increased.

This study attempted to overcome those limits of studies on methods and supplement the above analytical case studies, conducted the following experiments, and proved that the innovative methods proposed in this study could apply to conclude some useful results.

1) Experimental Object

The experimental object was to apply the proposed methods and brainstorming technique to the creative problem solving, and to prove that the methods proposed by the analysis method could be used to bring about a useful result.

2) Experimental Subject

It is very hard to drink hot coffee which loses its scent when it is cold. This study attempted to come up with an idea to innovate the existing disposable coffee, and let people easily drink hot coffee, and cool the coffee down slowly.

3) Experimental Method

The participants consisting of the students who work on master's degrees at the Korean German Institute of Technology were divided into two independent groups by experimental method; both groups were tested under the same conditions. The 9 members with various educational backgrounds in Team 1 learnt about the creative thinking for 10 hours, were divided into 2 subteams, and were tested with the application of the brainstorming technique for their divergent thinking. The 9 members with various educational backgrounds in Team 2 learnt about the proposed methods, were divided into 3 subteams with 3 members, and were also tested.

4) Experimental Period

The test consisted of an introduction to explain the questions for the test, a 30-minute test to apply the methods for each teams, and a 10-minute submission to integrate all the results of the tests.

5) Assessment

A separate team was invited to assess the test results from the above two groups. The ideas from both teams were mixed, and were provided to the assessment team members after they explained about the standards and contents for the test. Each member of the team independently assessed the ideas with the use of a 5 point rating scale. All members of the assessment team were students who worked on the doctor's course at the Seoul Venture University.

6) Assessment Standards

The ideas were assessed on the following 5 elements with the perspective of market value and business value. The 5 point rating scale was used.

B. Analysis on Experiment Results

The results of the independent assessment by 10 assessors with various educational backgrounds and jobs are shown in <Table 4>.

Evaluation Factors	Contents
Disruptions	Levels of thinking that destroys a clich
Easy	Degrees of no more extra R&D
Burdens	Burdens of Product cost
Completeness	Troubleshooting completeness
Customer convenience	Convenient degree

<Table 3> Assessment Standards

The table indicates that 60% of ideas from the method proposed showed 17 points or more; it is much higher than the results from the brainstorming technique because only 36% of ideas from the brain storming technique showed 17 points or more. In particular, 30% of ideas from the proposed method obtained the highest point; all three subteams showed the same results.

This empirically indicated that the proposed method not only identified the target of valuable innovation but also attracted the convergence of ideas.

The innovation method by proposed gene substitution was designed to innovate the fundamental attribute of the target of innovation and overcome the limits of the brainstorming technique which could produce various ideas but made it difficult to select valuable ideas from them.

The simple experiment in this study failed to provide participants with uniform background and uniform experimental conditions and sample spaces is not enough to assess thinking methods. However, it indicated that the proposed method was more useful to produce valuable results and the results were more convergent because of the ideas about fundamental attributes.

Evaluation Result	Brain storming	Proposed Method
Top		30%
Above 19 **point**	18%	40%
Above 17 **point**	36%	60%

<Table 4> Top Assessment Ratio for Each Method

It is still difficult to directly define the superiority of a certain method based only on the test in this study because the production of ideas is variable depending on the creativeness of the participant, the theme of test, and combination of team members. However, the proposed method provided a vantage point to start to produce ideas for the creation of innovative values and the thought process to lead ideas to flow from the relevant technology used to substitute the fundamental genes to the other products with similar genes and customer needs. Thus, the proposed method is not only more

freely than the other thought techniques which freely produce balanced ideas, but also more effective because it is directed.

7. Conclusion

There have been numerous studies on the necessity of the innovation and the direction of innovation; however, there are not many studies that have successfully introduced specific methods which can be actually used by companies to lead the disruptive innovation. This study made a consilience between the evolution theory and innovation theory, we found that the disruptive innovation mechanism of the product can be drawn from the macroevolution mechanism of life by a conclusion of consilience analysis even though life and the product are placed in different fields. We theoretically explained that a company which successfully understands the gene of a product can create a disruptive innovation, a macroevolution of a product, by changing the gene of the product which is corresponding to the unchangeable 'cliché' or fundamental attributes of the product like changing the gene of life.

We also suggested product evolution model and 3 kind of insight concepts for innovation. This study applied the existing customer insight theory to the product evolution model by causality, expanded it, newly organized the relationship between the necessity and role of both customer insight and product insight and environment insight, explained the necessity of using the existing customer insight for the progressive evolution, and investigated detailed methods for the disruptive innovation.

As the result of 3 case studies and experiment, we show our proposed method could systemically explain why it is a case of disruptive innovation and satisfied the usability and usefulness by user.

The existing methods to produce innovative ideas provide a massive amount of ideas by random thinking based on creative thinking techniques; on the other hand, the innovation methods by proposed limited the space for producing ideas to a small space consisting of the fundamental attributes of the product/service and environmental elements for creative exploration, and led a fundamental and disruptive innovation based on the effective and logical progresses.

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