İSTANBUL TECHNICAL UNIVERSITY ★ INSTITUTE OF SCIENCE AND TECHNOLOGY

'KILLER PRODUCTS' IN THE NEW MARKET ECOSYSTEM: AN ANALOGICAL APPROACH INSPIRING NOVEL IDEAS IN THE FIELD OF DESIGN

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Programme: Industrial Product Design

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İSTANBUL TEKNİK ÜNİVERSİTESİ ★ FEN BİLİMLERİ ENSTİTÜSÜ

**YENİ PAZAR EKOSİSTEMİNDE 'KATİL ÜRÜNLER':
TASARIM ALANINDA YENİ FİKİRLERE İLHAM VEREN
ANALOJİK BİR YAKLAŞIM**

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ABBREVIATIONS

APS	**:**	Analogical Problem Solving
AT&T	**:**	American Telephone and Telegraph Company
Apps.	**:**	Applications
BTPs	**:**	Breakthrough Products
CD	**:**	Compact Disc
IBM	:	International Business Machines Corporation
MS	:	Microsoft
OS	:	Operating System
PC	:	Personal Computer
R&D	:	Research and development
2D	:	Two Dimensional
3D	:	Three Dimensional

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KILLER PRODUCTS' IN THE NEW MARKET ECO-SYSTEM: AN ANALOGICAL APPROACH INSPIRING NOVEL IDEAS IN THE FIELD OF DESIGN

SUMMARY

There is an obvious analogy between market space and biological ecosystem. In this analogy, products might be regarded as species, market success as natural selection, etc. From this fertile analogy, this paper proposes to examine `killer products', making comparison with "killer weed" (*Caulerpa taxifolia*) in the Mediterranean; a type of algae, formerly used as aquarium ornamentation, accidentally released to the Mediterranean Sea in 1984. This seaweed prevents other plants from growing and gets the nickname "killer algae". Its "success" might be harmful to the ecosystem as a whole. The question of whether there are products like killer weed is considered as a starting point in this research.

In this study, the concept of `killer product' is introduced. The aim is to reach a clear and coherent definition and describe properties of killer products as a term. This novel concept is investigated through analogy-similarity method by drawing an analogy between *Caulerpa taxifolia* and killer products. Investigation thorough reaching the idea of killer products; metaphors and concepts are considered by the patterns of *Caulerpa taxifolia* along with the dynamics of new market economy and contemporary customers.

Basically, another research method used in the dissertation in addition to analogy method is case study. Analogy is used to reach the basic definition and case study is used to verify the definition and properties of the killer product. Apple iPod-portable music player is chosen as the single case study. Besides to iPod example, various killer products and technologies including QWERTY, MS Windows, Nokia Cell phone and some others are investigated to understand the concept of killer product.

In addition to defining what killer product is, the role of design in creating killer products is investigated and whether killer species-products are unpredictable and uncontrollable are questioned. In short, this thesis attempts to summarize what makes a product `killer' and the role of design in this process.

Consequently, we could say that a killer product is an (invasive) product that disorders its particular market by covering a very large space. The basic features of killer product might be given as being aggressive, highly pervasive and indispensable. Imposing its rules in the market makes a product killer. For example, forcing incompatible standard in software market is a common way of showing this kind of aggressiveness. Truly killer products create value for consumers, extend the category, generate higher margins, and strengthen the brand.

Killer products dominate a kind of aesthetics in the market and in the field of design. The language of form is driven by the killer product. The number of products that mimic killer product and each other is increased, conversely products differentiate from killer products and against their standards are decreased.

Killer products are indispensable products for their users. Product-user relationship is strong, sometimes this relationship is passionate and sometimes inevitable and obligatory. The role of design is noticeable in the process of this strong relationship built between the user and killer product. Otherwise, the role of design is limited, mostly brand and marketing issues gain importance; however, there are products like iPod, the role design is significant in many aspects, in the process of product development.

YENİ PAZAR EKOSİSTEMİNDE 'KATİL ÜRÜNLER': YENİ FİKİRLERE İLHAM VEREN ANALOJİK BİR YAKLAŞIM

ÖZET

Piyasa ve biyolojik ekosistem arasında belirgin bir benzerlik vardır. Bu benzerliğe göre ürünler canlılarla, piyasa başarısı da doğal seçilim ile ilişkilendirilebilmektedir. Bu çalışmanın amacı, bahsedilen benzerlik ile doğadaki "katil yosun"dan ilham alarak global pazardaki 'katil ürünler'i incelemektir. Bunu yaparken de Akdeniz'de yaşayan ``katil yosun''dan ilham almaktadır. *Caulerpa taxifolia*, bir çeşit yosundur; aslında bir akvaryum süsüdür, yanlışlıkla 1984 yılında Akdeniz'e salınmıştır. Bu yosun etrafında bulunan diğer yosunlara yaşama alanı bırakmaması nedeniyle `katil yosun' takma adını almıştır. Bu canlının `başarısı' ekosisteme ve diğer canlılara tehdit oluşturmaktadır. Benzer özelliklerde ürünlerin pazardaki varlığını ve yerini araştırma isteği, bu çalışmanın başlangıç noktası olmuştur.

Bu çalışmada, 'katil ürün' kavramı ortaya atılmış ve bu yeni kavram araştırılmıştır. Net, açık ve tutarlı bir tanıma ulaşmak araştımanın ana hedeflerinden biridir. Bu yeni kavram araştırılırken temel inceleme yöntemi olarak analoji- benzerlik ilişkisi- kullanılmıştır. *Caulerpa taxifolia* ile çeşitli ürünler arasında benzerlikler kurularak tanım ve özelliklere varmak hedeflenmiştir. *Caulerpa taxifolia* örüntüsünün kavramlaştırılması ve benzetmenin araştırılması yeni pazar kavramı ve modern kullanıcı dinamikleri gözetilerek yapılmıştır.

Analoji yöntemiyle birlikte kullanılan diğer yöntem örnek vaka çalışmasıdır. Analojiden faydalanarak ulaşılan tanım ve özellikler vaka çalışması ile soruşturulmuş ve doğrulanmıştır. Apple'ın iPod müzik çalar ürünü tekil vaka çalışması olarak seçilmiş ve incelenmiştir. iPod örneğinin yanında, QWERTY, MS Windows, Nokia cep telefonu gibi çeşitli ürünler ve teknolojileri da incelenmiştir. Katil ürün kavramı ile bir çok ürün üzerinden ilişkiler kurularak kavram araştırılmıştır.

Tanım ve özelliklere varma hedefinin yanısıra tasarımcıların katil ürün oluşturma sürecindeki rolü sorgulanmıştır. Katil ürünlerin tasarım ve ürün geliştirme sürecine etkileri, katil ürün-kullanıcı ilişkileri araştırılmıştır. Kısaca bu çalışmada bir ürünü katil yapan özelliklerin neler olduğu ve bu süreçte tasarımın rolü ve etkisinin olup olmadığı, incelenmiştir.

Araştırmanın sonucunda varılan tanım şudur; katil ürünler, içine girdikleri özel pazarda çok alan kaplayarak, dengesini bozan, saldırgan ürünlerdir. Temel ortak özelliklerinde, yaygın olmak, kaçınılmaz olmak, saldırgan olamak göze çarpmaktadır. Pazarda varolan diğer ürünleri pazarın dışına atarken, kendi kurallarını dayatan ürünler olarak ön plana çıkar. Yazılım endüstrisinde karşılaştığımız uyumsuz, bağdaşmayan format ve standartlar buna örnektir. Bunun yanında, katil ürünler çoğunlukla pazarda başarılı olan, kullanıcıya değer-fayda sağlayan, yüksek satış seviyelerine sahip olan, marka kimliğini güçlendiren ürünlerdir.

Tasarım olarak incelediğimiz de bu ürünlerin piyasada, tasarım alanında baskın bir estetik anlayışı yarattığını görürüz. Katil ürünlere yakın özellik ve stillerde, birbirine

benzer bir çok ürün pazarda çoğalırken, katil ürünlerden farklı, katil ürünlerin kurallarına uymayan ürünler pazardan silinir. Bu durum ürün çeşitliliği üzerinde olumsuz etki yaratmaktadır.

Katil ürünler kullanıcıları için vazgeçilmez ve/veya kaçınılmaz ürünlerdir. Ürün, kullanıcı ilişkisi güçlüdür, bu bazen tutkulu, bazen de zorunlu olabilir. Kullanıcı ile kurulan güçlü ilişkide, tasarımın rolü ön plana çıkmaktadır. Katil ürün yaratım sürecinin diğer aşamalarında tasarımın rolü sınırlıdır, daha ziyade marka, pazarlama, etkin bir ağa sahip olmak gibi özellikler ön plana çıkmaktadır. iPod örneğinde ise tasarım bir çok aşamada ön plana çıkmıştır.

1. INTRODUCTION

This chapter covers an introductory background to the research subject. Why this research has been done, justification of the study, and objectives of the research are introduced. At the end of the chapter, structure of the thesis is set up.

1.1 Background of the Research Subject

For those having a chance to gaze around the Caddebostan coast of Istanbul, (the Sea of Marmara, Turkey) there is only one type of algae that can be noticed. It is *Caulerpa taxifolia*, frequently referred as `killer weed', which covers so dense a space in the sea floor that it prevents other sea plants from growing. At first, it was an aquarium ornament. But it was accidentally released from an aquarium in Monaco in 1984, to the Mediterranean, pervade this area that it got the nickname `killer algae' **(Borum et al, 2004)**. Inspiration of the killer weed leads to question whether products are similar to it. Preliminary research has revealed that there is no establish definition of the `killer product' title, the basic publications usually do not mention the concept of `killer product' and most of the indexes do not include `killer product' as a term.

Socio-cultural and technological evolution of the market leads us to a new era where we are surrounded with the high level of competition. New technologies, products and services change the basis of competition. Increasing competitiveness, winning by design, explosive growth and dominating the market have become significant issues for the business. Consumers are facing the battles of technological dominance and standard wars. Industrial design is forced by the constant threat of drastic innovations by the rivals. The demand is for products that have high market share, are competitive, smart and satisfy the user while making the purchase decision more certain. In other words, the industry is well positioned to create killer products to disorder the market.

As **Evans and Schmalensee (2002:1)** mention:

> "Firms engage in dynamic competition for the market – usually through research and development (R&D) to develop the 'killer' product, service, or feature that will confer market leadership and thus diminish or eliminate actual or potential rivals. Static price/output competition on the margin in the market is less important."

Evolutionary approaches have been widely adapted by the field of design, economy, engineering, software design and social sciences. Biological inspiration and evolutionary understanding are used as a methodology to find novel ideas, to solve problems.

Design is a strategic issue concerned with building and maintaining the competitiveness of individual firms, industrial sectors and even whole market. Highly innovative products and services offer new, individual and collective experience for consumers. Multi-dimensional approach for the problem solving activity of design offers new opportunities and helpful to understand product development process. The notion of `killer product' is not only a product, service or an idea for technology, design and innovation but also a strategy for the field of design and business.

The economic importance of sparking ideas for `killer products' that will positively affect the company's success and growth is clear, but the characteristics of killer products or which of these characteristics are critical for the design process are rarely discussed.

1.2 Aims of the Research and Justification of the Study

The subject of `killer product' has been used by some researchers from the field of marketing and management **(Christensen, 2003; Chang, 2005)**. Most of the works are through web sites that describe market success of products or applications for entrepreneurs **(Business Launch, 2008; Gardner, 2006; Breaker, 2008)** or else by some blogs which are commercial advices for small business **(Sampson, 2008; Dotson, 2008; Knowles, 2008)**; however, most of these works in nature are not rigorous or part of academic research tradition rather they are informal and mild advices. More importantly there exists no definition for the `killer product' concept.

Researching the idea of `killer product' and key terms related to the concept has revealed that fundamental concepts remain confused and ambiguous. The key terms in the literature are customarily analyzed from the perspective of marketing and management, but not from the perspective of design. What is the place of the concept of killer product in the field of design?

Furthermore, this research emphasizes the evolutionary approaches and biological studies since the inspiration point of this thesis comes from the nature by holding a fertile analogy. One aspect is to question what can nature teach us? As **Tinsley et al. (2007:2)** stated that "analogy with nature has been shown to inspire novel ideas". Analogical approach is utilized for the framework of the study, therefore standing on

a clear, strong analogy rather than a literal similarity is a critical. Widening the inspiration for designers and researchers is also concerned. Where does this research lead us?

The research concerns have been specified in a straight and clear fashion. This research study aims to:

1. Define what killer product is

  • Clarify the definition and significance of the 'killer product' concept

  • Describe what makes a product killer

  • Identify properties, dimensions of the killer product

2. Examine a novel idea through drawing an analogy between aspects of biology and design.

1.3 Structure of the Study

Summary of the chapters one by one are explained briefly below:

Chapter I (Introduction): This very first part aims to build an introductory background to the research subject. Explanation of the research aims and justification of the research are also documented in this chapter. Besides, the basic structure of the study is included at the end of the part.

Chapter II (Research Methodology): This chapter presents the research methods carried out through different stages of the research study. Descriptive research through critical literature review, in addition to case studies on particular killer examples are the research methods used in the dissertation. Moreover, the chapter introduces the specific research approach; analogical approach to understand new ideas. The methodological representation of analogical problem solving and analogical suggestion of the research subject is built here.

Chapter III (Conceptual Background for Killer Products): Literature review focuses on concepts and terms related to the idea of killer products from variety of resources and perspectives. The themes addressed here comprise technology, evolution and marketing. Categories, properties and origins of killer product are explored in detail as well. Building the background information is starting with describing the environment of the killer products. New market, its dynamics and market evolution are examined. Secondly, killer terminology in literature in other words terminology related to the concept of killer product in literature is built on this part. Besides,

technological reasoning of killer products and its terminological history are documented in the chapter. Finally, 'innovation' is examined as a process through which killer products are created. The research does not exclusively focus on sources of innovation. Nevertheless levels of innovation, as it is characterized by its impact on existing markets, are analyzed in relation to technical and organizational change of products to what we call "killer product".

Chapter IV (Analyzing through Analogy): This part focuses on how to conceptualize killer products. This is achieved by mapping across features which are perceived to play the same role in both source: killer weed, *Caulerpa taxifolia*, and target: killer products. Theoretical and real-life comparisons are utilized as a analytic tool to stimulate properties and categories and dimensions of the subject. The priority of the comparison is on understanding the similarities rather than the differences. Similarities are categorized into various sections. These different sections represent discrete properties of killer products. Differences are not eliminated though; they are examined in the section of limitation of the analogy. Moreover in the beginning of the chapter, biological understanding and biological analogies are examined thorough looking evolutionary economics and biomimicry studies.

Chapter V (Definition and Importance of Killer Products): The central theme of this part is to define what killer product is. The abstract representation of the analogy between killer weed and killer products are identified as properties, categories and dimensions of killer products. Also in the chapter early usages of the killer product phase from different contexts are discussed. Highlighting the importance of the 'killer product' definition is issued. The literature involves usages of killer product phrase which are discussed either they address any definition of the killer product or these studies achieve scientific rigor.

Chapter VI (Case Study: iPod): Introduces a reference to the killer product definition, properties and design & innovation process carried out on specific example. In this part, Apple iPod is researched. Single case study is selected on the basis of killer product concept. Apple is the richest information and well represents the definition and properties of the term of killer product. Previously explained definitions and properties are tested on this critical example of killer product. Along with, the impact of killer product to the field of design is investigated in this part.

Chapter VII (Discussion and Conclusions): This chapter draws a conclusion of the study; also discuss the analogical understanding through metaphor and model. Design related issues are discussed in this part. In addition, shortcomings of this research is discussed, further implications is introduced at the end of the chapter.

2. RESEARCH METHODOLOGY

The research process has been initiated by a weed *Caulerpa taxifolia* which is not directly related to products and industrial design. In order to define the research question the research is continued with preliminary investigation phase. According to **Yin (2003)**, "Defining the research question is probably the most important step to be taken in a research study." The methodology chapter is stressed by detailed explanations since this research aims to investigate a new subject through drawing an analogy between aspects of biology and design. Another reason for this emphasis is that analogy based method is not established methodology used to answer the research questions.

2.1 Introduction

This chapter presents the research methods carried out through different stages of the research study. Research aims are also outlined in the chapter. Descriptive research through critical literature review and case study are the research methods used in the dissertation. Besides, this chapter also allows reader to gain an understanding about methodological explanation of how the killer alga (*Caulerpa taxifolia*) is analyzed. Analogical approach respect special attention since it is at the core of understanding the idea of `killer product'.

There are different phases in this research. Research route is schematized in the figure 2.1. Firstly, research process starts up with an inspiration that comes from *Caulerpa taxifolia* that leads to question: what killer product is. Secondly, we search for a model. The properties of *Caulerpa taxifolia* are used as a model to solve the problem of describing the concept of `killer product'. This model is used as a metaphorical suggestion between the aspects of killer algae that disorder the seafloor and killer products that disorder the market to examine the notion of the killer product. Thirdly, a pre-definition is made. Following, the research phase is continued with critical literature review and case study method to evaluate pre-definition. Critical literature review and case study findings help to actualize the subject. Finally, synthesis of the case study and literature findings lead to refined

definition, conclusions of the subject. The research process is finished with implications of further research.
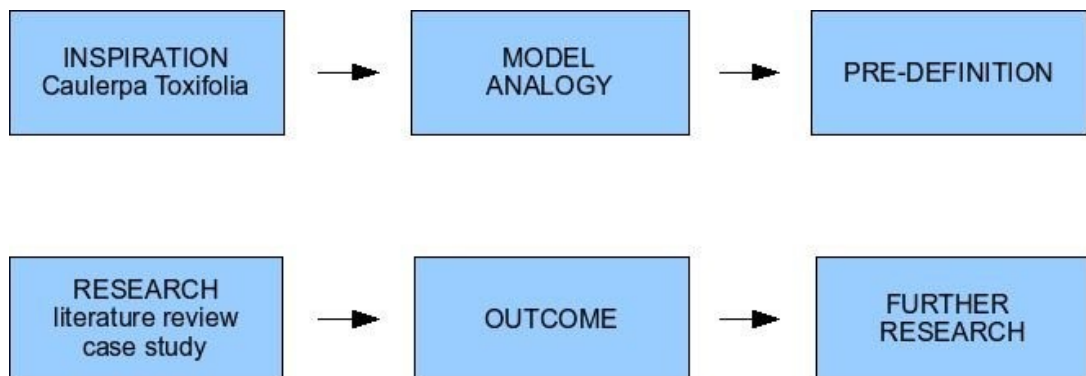
Figure 2.1 : Phases of the research.

2.2 Approach to Research Methodology

This section aims to provide an explanation of the research method and also a justification for choosing the approach. `Killer product' as a novel term was not investigated in an empirical research approach. How to analyze the subject is a hard task. Realization of research builds on various research techniques. The aim is to integrate the different components of these research methods in a cohesive and coherent way. The research process particularly stresses analogical approach by building an analogy between various `killer product's and `killer weed Caulerpa taxifolia in addition to literature survey and case study research techniques.

2.2.1 Drawing Analogy

Analogy is a similarity relationship between two different entities. Forming an analogy is an influential tool when trying to understand a new situation or solve a new problem **(Yanawitz, 2001)**. We could have offered the analogical problem solving as a research methodology. Nevertheless, as a formal method for investigation, analogical understanding is far from a developed science. However, constructing an analogy is a strong tool in this research for conceptualizing the killer products and the environment (market) surrounds them. ``In language, metaphorical usage of a concept is a transfer of understanding between a source domain and a target domain'' **(Lakoff & Turner, 1989:42)**.

"At a global level, analogy is used to generate knowledge applicable to a novel target domain by transferring knowledge from a source domain that is better understood'' **(Holyoak and Koh, 1987:332)**.

Holyoak describes analogical problem solving in terms of four basic steps.

"1. Constructing mental representations of the source and the target

2. Selecting the source as a potentially relevant analogue to the target;

3. Mapping the components of the source and target;

4. Extending the mapping to generate a solution to the target" **Holyoak (1984 cited in Holyoak and Koh, 1987:332)**

Steps defined by Holyoak are followed in the research process. To begin with, source problem is the killer alga and the target problem is (to understand) the killer product. Second step; plausible analogy is built between killer product and killer alga, which is introduced in the very beginning of the thesis. Third, mapping features that have a parallel role in both source and target problem is figured out at the fourth chapter. Fourth step is generating a solution for the target problem, which is defining what killer product is and the characteristics of the killer product is dealt in the fifth chapter.

Different kinds of analogies are used in this aim. We observe source problem and search for answers for the target problem. By doing so, the vocabulary found in the weed transferred to vocabulary of products as a method of reaching efficient analogous system.

The list of analogies:

1. Product and Species

2. Product life cycle and Living phases

3. Market place and Eco-system

4. Technological change and Evolution

This thesis presents potential benefits of analogical approaches. Metaphorical suggestion is obviously a critical part of the study. The analogical problem solving is used for creating innovative solutions in the industrial design field. The abstraction of the problem and reaching the systematical solutions in the process of drawing the analogy make the process scientific. There exists works focus on the development of an applied methodology for the research of bionics in the design field.

Figure 2.2 explains all stages of the methodology described by Junior and Guanabara, the development of products based on the study of bionics.

The first schema contains expectations regarding the outcome of the design process and originates in the definition of the problem space, while the second schema is needed to understand the relevance of the unexpected result.
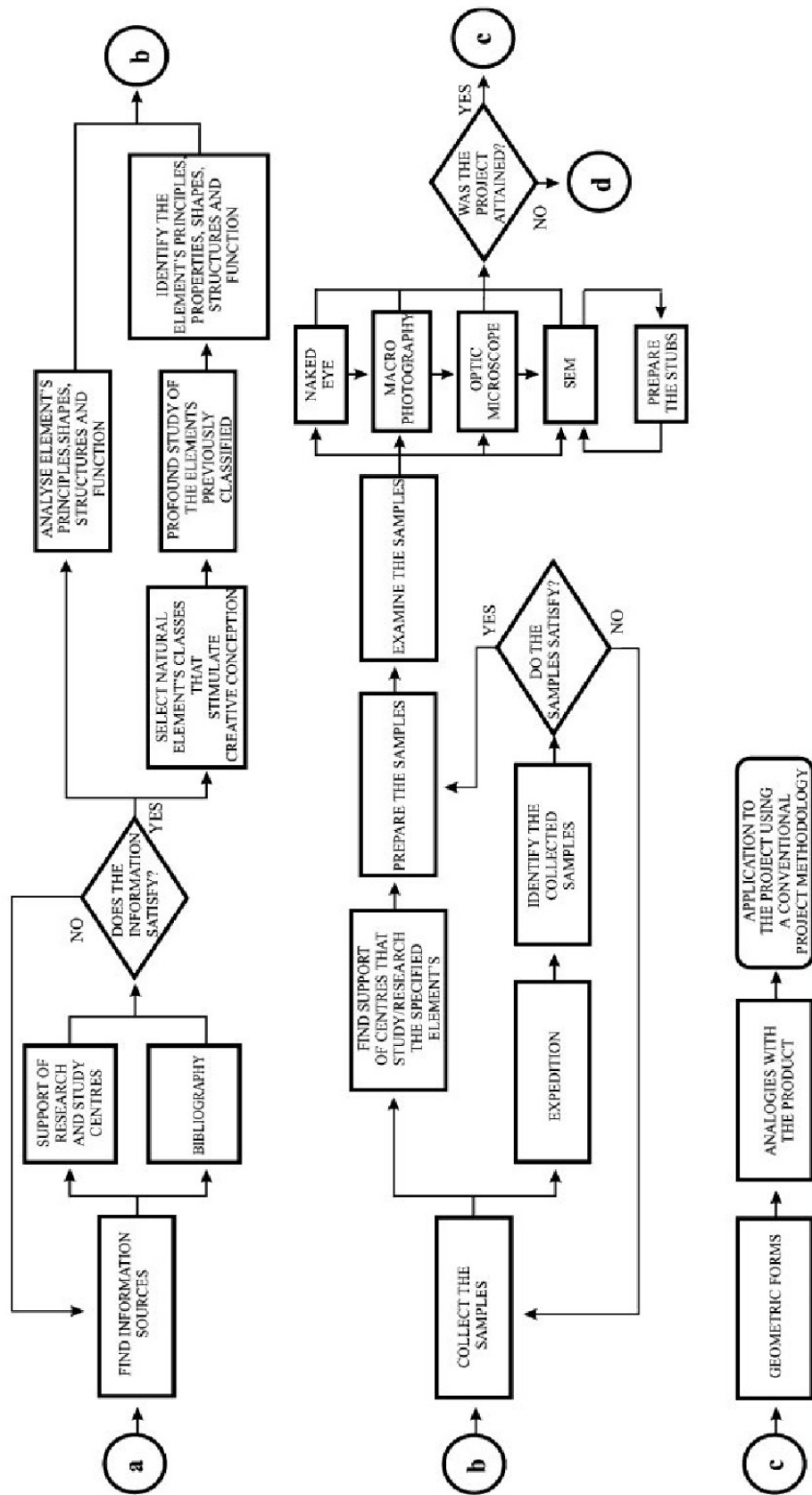
Figure 2.2 : Drawing Analogy **(Junior and Guanabara, 2005:153)**

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Koestler (1964) suggests that there exists a parallel between the notions of creativity in design as well as in poetry, literature and other fields in the sense that "the logical pattern of creativity [...] consists of discovery of hidden similarities".

In a typical suspense movie, the audience is lead to believe that the plot will evolve according to a familiar schema. The suspense, however, is triggered when clues indicate that the original schema was just a diversion and that another schema can be applied to understand the plot. Likewise, when a schema not previously taken into consideration must be brought into use to understand a design concept, it can be concluded that the concept is truly novel. If the new schema, in a satisfactory way, can be used to understand the design, the design solution is a possible innovation.

Certainly, every analogy has its limitations and weaknesses but it is still worthwhile to consider the resemblances and differences.

2.2.2 Building a definition

Building the definitions is notably critical within the research process. "What is killer product?" is a fundamental question in the dissertation, which aimed to be solved. Balanced the idea flow through a coherent, clear and distinct definition is attempted. The aim of the research is to articulate what killer product is and unique nature of it therefore building a definition is a leading step of achievement of this study. A definition must set out the essential attributes of the thing to be defined. The literature might be found confusing and to some extent ambiguous for the killer product concept. Systematization of the related terms and concepts is needed. The common and distinct features are questioned and identified so as to conceptualize killer products.

The word, definition, is originated from "definiendum, Latin, that which is to be defined. The words which define it are known as the definiens; Latin, that which is doing the defining.'' It is also described as ``the act of making clear and distinct: a definition of one's intentions'' **(Dictionary, 2008)**.

The five major kinds of definition (distinguished by the functions they may be used to perform) include:

      1. lexical definition

      2. stipulative definition

      3. precising definition

4. theoretical definition

5. persuasive definition

Lexical definitions are reported, accepted definitions, such as dictionary definitions. The goal here is to inform someone else of the accepted meaning of the term on the contrary, stipulative definition is a definition for a new term, "freely assigns meaning to a completely new term, creating a usage that had never previously existed" **(Kemmerling, 2002)**. Since the goal in this case is to propose the adoption of shared use of a novel term, there are no existing standards against which to compare it, and the definition is always correct (though it might fail to win acceptance if it turns out to be inapt or useless). Precising definition is the refined, improved definition of a lexical kind of definition by stipulating its features. The aim is to reduce the vagueness of a term. Theoretical definition is "a proposal for understanding the meaning of a term in relation to a set of scientifically useful hypotheses" **(Kemmerling, 2002)**. Some philosophers, such as **Copi and Cohen (cited in Swartz, 2008)**, claimed that theoretical definitions are exclusively for science and philosophy rather than ordinary usages. Persuasive definitions aim to influence, convince the audience for personal values. According to **Stevenson (1938; cited in Kemmerling, 2002)**, in persuasive definition, manipulating the meaning of term by emotional and personal estimations is widespread. Definition of killer product is in the category of stipulative definition and also a kind of theoretical definitions. Therefore, the aim of building the definition is to come up with a new description, not to improve or precise an older one. Killer product definition, as a stipulative definition, there is no comparable existing standards.

Killer product as a term or concept needs to be identified. Definition of term might be given as "something we hear or see, it is either a chain of sounds (in speech) or a letter sequence (in writing). In the sign language of the deaf, a term is a combination of gestures." On the other hand, a concept might be viewed as "an abstract entity, not the sounds we hear or the letters or gestures we see, but what we understand by hearing the sounds or seeing the written or gestural term" **(Endresen, Simonsen & Sveen, 2000; translated from Norwegian; cited in Seland, 2006:3)**.

How to attain statement of the meaning of the term killer products is considered in the research. **Friedman (2002; cited in Mutlu 2002:7)** defines various steps for building a definition.

1. State the research problem,
2. Discuss knowledge in the field to date,
3. Discuss past attempts to examine or solve the problem,

4. Discuss methods and approach,

5. Compare possible alternative methods,

6. Discuss problems encountered in the research,

7. Explain how the researcher addresses those problems,

8. Explicitly contribute to the body of knowledge within the field,

9. State implications for future research.

First step is stating the research problem, which is defining the killer product, is held in the introduction part of the research. Secondly, discussing the related knowledge in the fields of design and management is dealt with in literature review phase of the research. There are several key terms related to the subject area. Theoretical studies involving key terms of killer product is analyzed in third chapter. The difficulty is ambiguity of the key terms and lack of standardized terminology. Analogical approach with its highs and lows is discussed in the fourth and seventh chapters of the study. Seventh step, how the researchers dealt with this question and the term "killer product" are discussed in the fifth chapter of the thesis. Final chapter covers discussing the problems encountered in the research and how research might contribute to the knowledge in the field of design. Further studies are explained in the final section of the study.

2.2.3 Literature survey

Taylor (2008) outlines the literature review as:

A literature review:

• Needs to be organized around and related directly to the thesis or research question,

• Synthesize results into a summary of what is and is not known

• Identify areas of controversy in the literature

• Formulate questions that need further research.

Literature survey is going through key terms related to this term considering design, innovation and market. While examining the killer products, not only design but also management and marketing perspectives are considered. Besides, this research concerns the knowledge in the field of biology although biology and marketing are the new research areas for the author.

The research findings are generally in the area of management and marketing. However the dissertation emphasizes the design concerns and design point of view. In order to emphasize the design concerns, the relevant information from different fields are identified. **Gray and Malins (2004)** discuss the relevancy of the material in the figure 2.2. Most of the information reviewed in literature survey process is irrelevant. Besides, there are different degrees of the specification of the

information. So the literature review starts from the general topics at first but later on focuses on killer product patterns such as aggressiveness and pervasiveness.
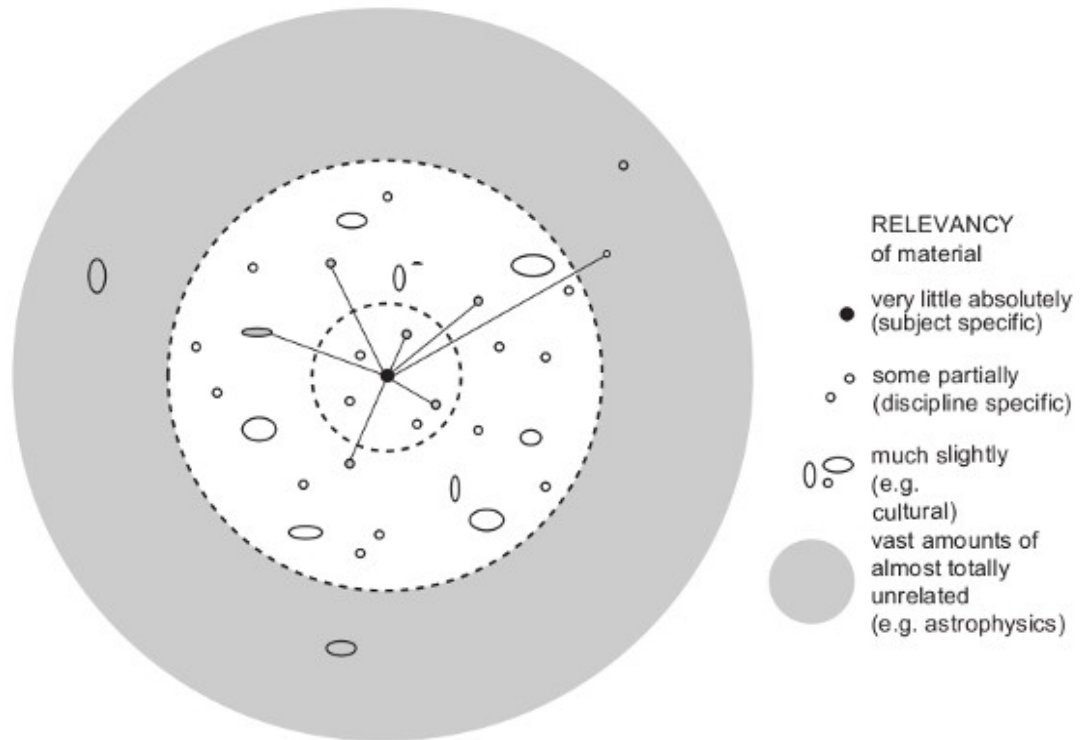
Figure 2.3 : Relevancy of material **(Gray and Malins, 2004)**

Moreover the nature of killer algae is directive on making literature survey and limits the shape of the inquiry. Firstly, *Caulerpa taxifolia* is investigated. The findings are used as a model/pattern for killer products. The relevant characteristics of *Caulerpa taxifolia* for the model of killer product are directive through literature survey. The key terms are researched not only connected with killer products but also essential for understanding the killer product idea.

Literature review part of the study does not only provide historical information of the subject but it also claims the importance of terminological standardization, which can stimulate cumulative research of the idea of killer product.

As for innovation and design, the review focuses on distinct innovation pattern and tends to be selective through looking particular key words such as radical innovation, disruptive innovation. Furthermore, evolutionary approaches are researched, particularly biomimicric studies, analogy methods.

2.2.4 Case study

The characteristics found in nature are carefully evaluated for the properties and pre-definition of killer product. Examining the schema, characteristic and pre-definition searched in detail through comparing particular products, which are

believed the potential "killer products". Therefore information oriented sampling is appropriate regards to other sampling techniques of case study method. While selecting the cases the examples that are richest in information and overlapping with definitions and properties are preferred. Case study technique in this dissertation proposes to test the theory of killer product. Examples provide sufficient information to evaluate findings and properties of killer product. Furthermore the case study phase of the research also serves for recognition the design process of killer products.

The case study design started with multiple case design, four examples of the killer products were selected; QWERTY keyboard, Apple iPod, Nokia cell phones and Microsoft Windows. These examples are equally important to addressed the research questions; however, in the process of data collection, iPod has became significant case, it represents the "critical case" **(Yin, 2003)**, it tests the theory well and potential to contribute to development of theory and knowledge. Besides, the most relevant information is obtained related to the iPod compared to other cases. The case study design therefore is worth conducting to a single case study at the end. By doing so, other examples of killer products are not missed, the descriptive information of Microsoft-Windows, Nokia, QWERTY are embedded into the dissertation. Relevant information is found mostly in the chapter four and five. Moreover, all examples are discussed to conclude the dissertation.

As for data collection, individual sources mostly inapplicable such as interviews with the designers or design team concerning the available time and budget. Surveying, questionnaires is not efficient a technique. Archival records, reported design process are used instead of interviews with the design team considering limited time and sources.

Conclusions are based on case studies of individual products, not on cross-sectional studies that use large samples of products. The main objective of the case study is to understand design process of killer products and unique characteristic of these products that lead these products to killer state.

2.2.5 Analyzing the data

Data collection and data analysis process are aimed to be handled simultaneously. Analyzing the data is composed of case study findings and outcomes from the analogy. Analysis phase, especially analysis of the data obtained from the analogy seeks to identify patterns, code the data into various categories. These categories and patterns are reviewed repeatedly.

Synthesis phase involves discovering applying the characteristic revealed in the analysis phase on physical products. A list of major ideas is reached by the analysis through analogy, which are verified by the case study findings. Theoretical interpretation is grounding in the empirical reality.

The information regarding its significance are carefully identified and analyzed due to the limitation of the resources as time and budget. The intent is to pull all the analysis together to create concise formulation of the concept of killer product.

2.3 Conclusion

This chapter begins with the explaining the research process through presenting the stages of the research. The main aim is on explanation of the specific research methodology and the justification of this problem solving method. Along with, various research techniques used during the research study are outlined.

In the following chapter, related key terms of the killer product concept are reviewed. Existing knowledge will be useful for en-lighting the killer product idea and providing a better understanding within this field. These concepts will be studied initiating from the broad perspective of market, technological dominance and the innovation concept and lately focusing on the design concept.

3.CONCEPTUAL BACKGROUND FOR `KILLER PRODUCT'

This chapter is for systematization of knowledge in history to provide a basis of the killer product concept. Literature review focuses on concepts and terms related to killer products from variety of resources and perspectives. Categories, properties and origins of killer product are explored as well. How pervasive is this phenomenon? How consistent is the phenomenon? Environment of killer product and related terminology are explained in the chapter. Definition and properties of terms are not explained fully detail. However, it covers wide range of terms which attempts to identify specialties of each term and its relation with `killer product'. Furthermore, 'innovation' is examined as a process through which killer products are created. The chapter integrates wide range of work into coherent strategic framework which aims to provide coverage that is rigorous and inclusively accessible.

3.1 Environment of `Killer Product'

To better understand the killer product we need to know the environment it is produced. Industrial dynamics, characteristic of the marketplace, contemporary consumer's needs and expectations are defining factors of the environment of killer products. Killer products are result from high level of competition in the market. This high level of competition differentiates the marketplace which is the habitat of killer products. The evolution of industrial competitiveness in the market leads to emergence of killer products. Killer products are shaped within these characteristics of the environment.

3.1.1 Market evolution; new economy vs. traditional economy

The current trend of the market evolution is from "traditional" to what we call "new economy". In the old "traditional" economy, competition takes place primarily through price or output on the margin and through incremental innovation. In contrast, in the new economy, industries experience rapid technological change; competition, radical innovation or creative destruction through investment in research and development and on intellectual property **(Stenborg, 2002)**. Killer products are established by "market-destroying innovations" **(Evans and**

Schmalensee, 2002). In the popular press, these industries are sometimes called as new-economy or Evans and Schmalensee high-technology. Many have aspects that economists would call Schumpeterian, after the economist who described the process of "creative destruction". Creative destruction, is also used a key in this work, is introduced by the economist **Schumpeter (1942)**, describes the process of industrial renovation which goes along with radical innovation leading to sustained long-term economic growth .

Industrial and technological breakthroughs associated with the period of evolution, new economy created social and economic complexities for people and their environment. Market reshaped it self within these changes. Entrepreneurs, designers, consumers are affected from this process of change. **Metcalfe (1994: 931)** states ``as with any evolutionary argument the central concern is with the mechanisms of economic change, in this case in relation to the development of new technologies and patterns of organization, and their spread into the wider economic system''.

``The defining feature of new-economy industries is a competitive process dominated by efforts to create intellectual property through R&D, which often results in rapid and disruptive technological change." Nonetheless, economy has undergone an important transformation that has resulted in much "creative destruction" and increased investment in innovation in addition to stress the importance of intellectual property.

Metcalfe (1994:933) explains ``evolutionary approach in which asymmetries of knowledge and information play a central role: indeed it is not far-fetched to say that evolutionary economics is the economics of an imperfect, and from a conventional viewpoint, inefficient world." ``Tomorrow's businesses must innovate or deteriorate. They must design or die!'' **(Kirkpatrick, 1998).** Design is a strategic issue in evolution of new economy, so killer products emphasize this process renovation.

3.2 `Killer' Terminology

3.2.1 Killer application: definition and properties

Regarding the software industry; a killer application (killer app.) might be defined as "an application which is particularly significant or useful; a feature, function, or application of a new technology" that intentionally or unintentionally compels the consumer to make the decision to buy the system the application runs on. Killer apps. are traditionally, software that sell hardware. "It is presented as virtually

indispensable or much superior to rival products; also in extended use" **(Oxford English Dictionary Online, 2007)**. Clearly, killer applications are specifics form of killer products.

According to **Downes and Mui (2003)**, "killer applications will redefine the entire manufacturing-distribution-retail-finance business cycle, creating gigantic new markets while it undermines existing ones".

The effects of killer applications are indirect and unpredictable. Besides, their second order effects, which are far reaching and unintended, are more significant than first order effects **(Downes and Mui, 2003)**. ``IBM would have never believed that its own marketing of the personal computer system with its software and hardware from tiny partners Microsoft and Intel, would devastate their mainframe-centered business model and shatter their computer industry dominance in only a few years" **(Downes and Mui, 2003)**.

Killer applications are the digital form of killer products. Another issue is that evolution of the definition of design, **Dabberly (2008)** argues that the context of design is changing depending on the growth of electronic and information technology over past thirty years. Production tools and products has changed. Software design starts to be considered as part of product design. For example, the killer applications might be discussed. Killer application is mainly software that sells hardware but it is received in the product design category.

However, a killer product may not always be digital. An example from medieval times is the stirrup; a medieval weapon which helped Franks forces at war. ``Charles Martel, leader of the Franks, understood from his victory that the stirrup hadn't simply improved the effectiveness of his forces, as a new weapon or fighting formation might have done. Rather, it changed his entire military strategy. Stirrups made possible a mounted cavalry, a new element in the battle equation, and Charles Martel immediately made them a permanent feature" **(Downes and Mui, 2003)**.

3.2.2 Killer marketing

Killer marketing is not an established term, Feltenstein, in his book *401 Killer Marketing Tactics to Increase Sales, Maximize Profits, and Stomp Your Competition* 2005, uses `killer' as an adjective to describe the success of marketing plan. In his book, he explains 401 easy to use sure marketing tactics that can be used to increase sales and profits **(Amazon, 2008)**. An excerpt from the back cover is ``Surefire, down-and-dirty guerrilla marketing tactics for any business" **(Amazon,**

2008). This narrative presents the aggressive characteristic of the book, which is parallel to the killer product idea. There are also some examples to these tactics such as ``lottery ticket giveaways, discounts for customers who rip competitors' hands out of the yellow pages, paying people to picket your store with signs, proclaiming your low prices and great service...'' **(Amazon, 2008)**. These are just three of the hundreds of cheap, sure-fire marketing tactics especially for retailers contained in the book.

Feltenstein (2005; cited in Brown, 2007) identifies the followings as important objectives for killer marketing: increase awareness, increase community goodwill, increase frequency, generate traffic, and stimulating trial.

Feltenstein (2005; cited in Brown, 2007:1,2) outlines:

"seven steps to creating a killer marketing plan:"

1. Gather data.
2. Analyze them.
3. Set goals.
4. Develop strategy
5. Implement the plan.
6. Track the progress
7. Evaluate results

These tactics might be useful for being successful in the market. Nevertheless, they are not related to the concept of ``killer'' as it is intended in the thesis. Their resembling remains as similarity of names.

3.2.3 Category killer: definition and properties

Category killer is a retailing term, also known as Big Box Store. It can be defined as "A large retail chain store that is dominant in its product category. This type of store generally offers an extensive selection of merchandise at prices so low that, smaller stores cannot compete" **(Category Killer, 2008)**. Being cheaper, easier, bigger, or more popular might be the reasons for being category killer.

``Retailer offering such an extensive and comprehensive range of products of a particular type that it threatens to eliminate the competition'' **(Free dictionary, 2008)**. WALMART, a chain of large, discount department stores, is very successful as a category killer. Its chain has put smaller stores in a wide range of specialized categories out of business. Best Buy is an example of an electronics category killer. It might be also stated as "large companies that put less efficient and highly specialized merchants out of business" **(Category Killer, 2008)**. There has been

always a hostility to disruptive retail concepts, disruptive retailers, category killers such as Circuit City, for example, may find that consumers who are simply shunted from one alternative to another find learning difficult and experience significant frustration.

An example to category killer in furniture industry might be IKEA. IKEA is forcing its rivals to go out of business by being cheap, fighting through prices with its network of suppliers and sales in volume.

The concept of category killer is similar to killer product in terms of changing the ground of competition. Dominant, aggressive and pervasive characteristics of the category killer for its particular sector are parallel to the features of the killer product. We stress the characteristic of forcing its rivals out of business. Similarity of the names is quite appealing. However, their similarities are limited. Category killer is mainly a retailing term and its killer characteristic is not related to the products. Category killers are fighting on the ground of low price. Killer products, on the contrary, do not focus on prices to show its invasive character.

3.3Technological Arguments for the Killer Product

This section explains various technological arguments that support the process of creating killer product. These terms, concepts and ideas construct a base and are related to the functions of killer products.

3.3.1 Disruptive technology: definition and properties

Disruptive technology was introduced by Harvard Business School professor Clayton Christensen, in his book *The Innovator's Dilemma,* 1997. It is defined as "a new product or service that disrupts an industry and eventually wins most of the market share" **(Disruptive Technology, 2008)**. Companies aim to re-size market share by having disruptive technology.

Figure 3.1 (based on Christensen's The innovators Dilemma, 2007) demonstrates the performance outcome of disruptive technology.

Disruptive innovation often marginalizes or displaces older technology. For instance, disruptive digital photographing technology is pervasive. It is in the form of a digital camera or integrated into mobile phones. Furthermore, it is easy to use, convenient, simple, cheaper and quicker. Photographers substitute film-based cameras for digital ones, then chemical photo processing labs go out of business because their services are no longer needed. An example is Agfa Photo, a chemical film based

company, which announced it would provide no digital equipment **(Harrison, 2001)**. Afterward they went bankrupt in 2005 **(Digital Photography Review, 2005)**.
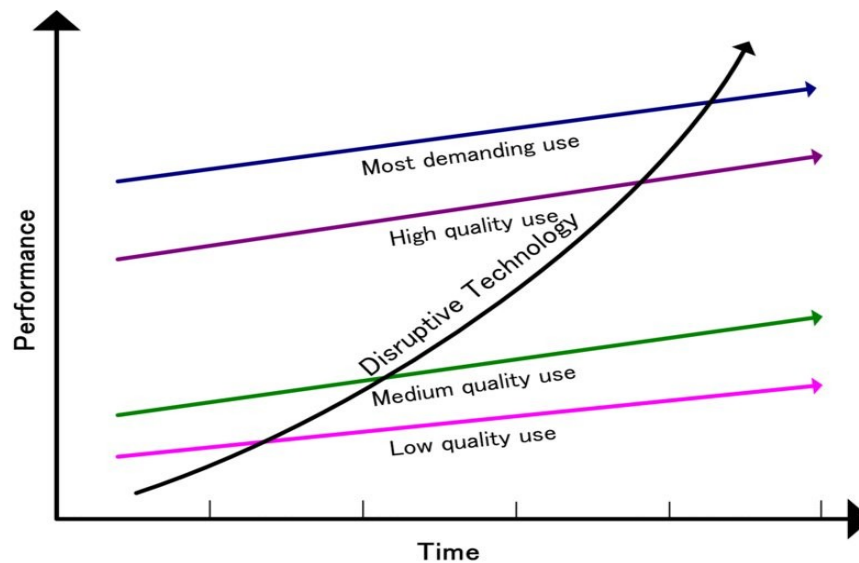
Figure 3.1: Disruptive Innovation (**Christensen, 1997 cited in Disruptive Technology, 2007)**

3.3.2 Creative destruction

Killer products are recognized by market-destroying innovations and creative destruction. The economist **Schumpeter (1942)** explains the process of industrial transformation that comes with radical innovation. According to his view, innovative entry was the force that sustained long-term economic growth. ``Creative destruction occurs when something new kills an old thing. A great example of this is personal computers. The industry, led by Microsoft and Intel, destroyed many mainframe computer companies but in doing so, entrepreneurs created one of the most important inventions of this century" **(Investopedia, 2008)**.

3.3.3 Technological cycles: technological discontinuities and dominant design

Technology cycles gains attention of researchers **(Abernathy and Utterback, 1978; Rosenbloom and Cusumona, 1987; Cusumano and Rosenbloom, 1992; Anderson and Tushman, 1990)**. Several studies attempt to identify and characterize it. The review of the empirical literature reveals variety of interpretations about some aspects of the phenomenon such as its underlying causal mechanisms and its level of analysis, but its characteristic remains complex. The killer product correlation with technological innovation is strong. Understanding the conceptual background and identifying terminology and getting connection with killer products are meaningful.

3.3.3.1 Discontinuous technologies

Technologies might become obsolete by discontinuous technologies before they get the opportunity to reach their limits **(Schilling, 2008)**. Discontinuous technologies are new innovations satisfy a similar market need as the older technology but by a totally new knowledge. For example, technological discontinuous happened when Once dominance has set in, the dominant technological design stays unchallenged until a discontinuous technology shakes the market at some point in the future; a technological discontinuity opens the door for a new entry and a new dominance process beginsthe transition from chemical based photographing to digital based technology.

3.3.3.2 Dominant design

"A product design that is adopted by the majority of producers, typically creating a stable architecture on which the industry can focus its efforts" **(Schilling, 2008:57)**. A single product or process dominates a product category. Once a dominant design is selected, market; firms, designers, customers focus their efforts on improving the efficiency in manufacturing, delivering this dominant design. By doing so, variety of technological and design options are not supported. In other words, dominant design is the selection of a technology adopted by firms, designers. The concept of a dominant design has taken on a quasi-paradigmatic status in analysis of the link between technological and industrial dynamics **(Murmann and Frenken, 2006)**.

The model of the product life cycle and the concept of the dominant design have received considerable scholarly attention in organization theory and in industrial organization **(Suarez, 2004)**. The notion of the dominant design and its role in changing the nature of innovation and market structure lead to empirical investigation and discussion over the past two decades **(Murmann and Frenken, 2006)**.

"A dominant design exists in a technological class when the majority of designs have the same technologies for the high-pleiotropy core components" **(Murmann and Frenken, 2006:944)**.

Technological discontinuity is the part of cyclical process that results from technological change and firms' adaptive responses. Designers provide an adaptive response to the technological developments. Discontinuity generally leads to radical product innovation. **Saviotti and Man (2003:256)** stated as:

> "Examples of discontinuities leading to the highest degree of qualitative change are the transitions between different dominant designs, technological regimes, technological

Figure 3.2 describes the technological cyclical; technological discontinuity leads to confused and complex period, era of ferment. This great level of uncertainty and competition ends with selection of dominant design. After selecting the dominant technology, there are lots of opportunities for incremental changes, modifications which are again stopped by a new discontinuous technology. "Once dominance has set in, the dominant technological design stays unchallenged until a discontinuous technology shakes the market at some point in the future; a technological discontinuity opens the door for a new entry and a new dominance process begins" **(Anderson and Tushman, 1990)**.
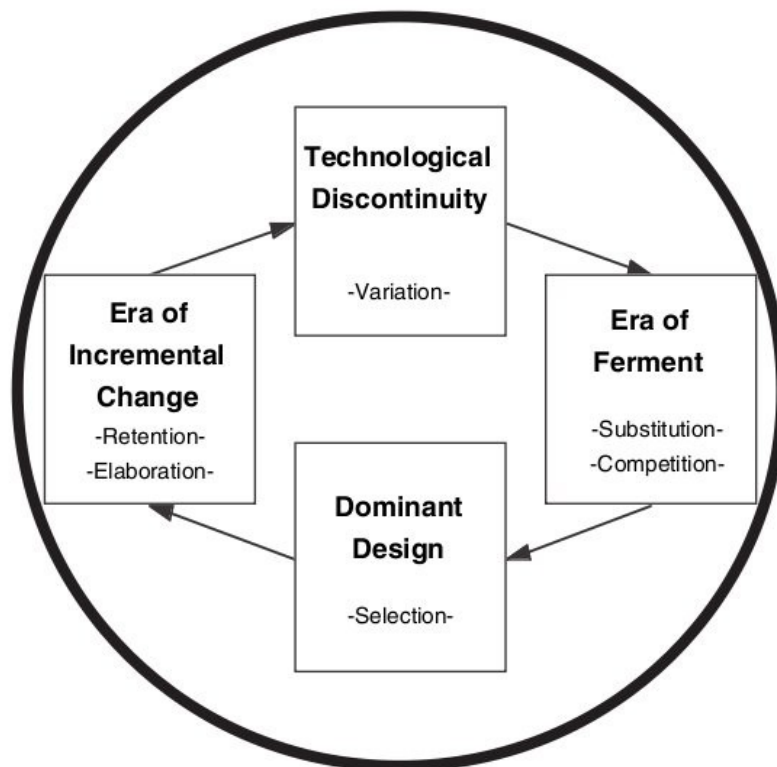
Figure 3.2: Technological cyclical **(Murmann and Frenken, 2006:946)**

3.3.4 Standard wars and battles for technological dominance

It is obvious that recent decades show us there have been dominance battles in technological designs. Achieving technological significance changes not only the fate of loosing and winning technologies but also affects the complementary goods & services and consumer experiences.

According to **Anderson and Tushman (1990)**, standards wars lead to two events; first, there is a clear sign that the most closely competing alternative design has abandoned the active battle, thus acknowledging defeat directly or indirectly. An

example of this event was when in 1988—after 12 years of active battle in the market—Sony acknowledged defeat by starting production of VHS-based VCRs;

Second type of event exemplified by a design has achieved a clear market share advantage over alternative designs and recent market trends unanimously suggest that this advantage is increasing. This type of event is exemplified by the fact that, by the mid 1990s, all the data suggested that the IBM PC design had irrefutably prevailed over the Mac design, even though Apple was still fighting hard—and continue to do so even today.

Shapiro and Varian (1999:16) define seven key traits for companies to be successful in the wars of standards. These are basically:

1. control over an installed base of users;
2. intellectual property rights;
3. ability to innovate;
4. first-mover advantages;
5. manufacturing capabilities;
6. strength in complements;
7. brand name and reputation.

``Adoption of a new technology can be painfully slow if the price/performance ratio is unattractive and if it requires adoption by a number of different players'' (Shapiro and Varian, 1999:13). It is a common argument for not willing to pass to a new standard, for instance QWERTY and Microsoft Windows case.

``A dominant position in one generation of technology (such as RCA enjoyed in the sale of black-and-white sets) does not necessarily translate into dominance in the next generation of technology'' **(Shapiro and Varian, 1999:13).** For example this can be seen in the case of Sony mini disc, Philips and Sony together developed the CD, which became widespread, adopted and supported by many complementary goods and consumers.

Suarrez (2004) describes the different stages of a dominance battle process in five key phases.

Phase I: R&D buildup

Phase II: Technical feasibility

Phase III: Creating the market

Phase IV: The decisive battle

Phase V: Post-dominance

The standard war of the PC operating systems was resulted with MS Windows dominance. The war between VHRs, Betamax is end with VHRs dominance. Standards are important part of understanding killer products. Figure 3.3 demonstrates a list of several factors leads to technological dominance. These factors could be categorized into two: firm-level factors and environmental level factors.
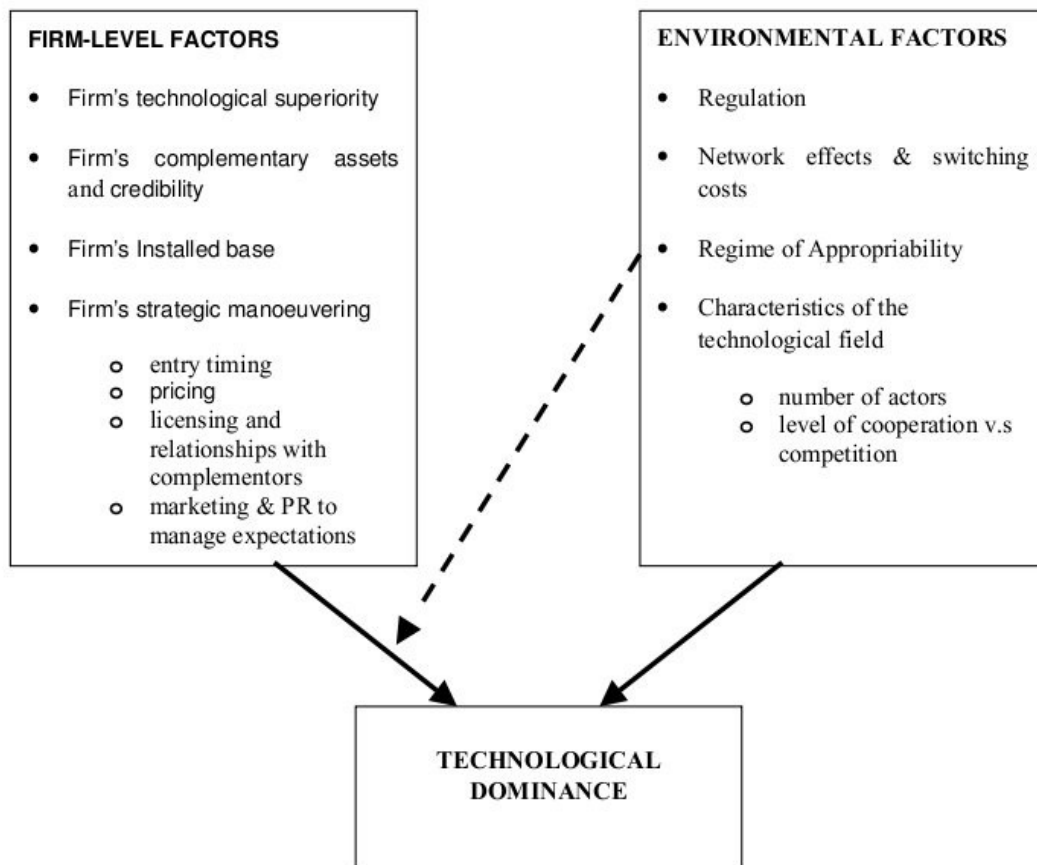
Figure 3.3: Firms and environment based factors result from technology battles
(Suarez, 2004:275)

3.4 Breakthrough products: definition and properties

Breakthrough products (BTPs) are successful, innovatory products. They are result from the environment that compels ``competitive pressures and market forces are augmenting the importance of product innovation as a source of competitive advantage'' **(Deszca et al., 1999:613)**.

Leeman and Winer (1997) states the properties of breakthrough products as being novel to consumer such as VCRs, open new category or expand that category competition such as personal computing vs. mainframes); are new to customers, often requiring substantial customer learning such as the Internet, raise issues

related to channels of distribution and organizational responsibility; and create the potential for new infrastructure and add-ons e.g., multimedia products/software and personal computers. Table 3.1 demonstrates attributes of breakthrough products are identified regarding to themes; market/customer, product and technology. **(Deszca et al1999)**.

Table 3.1: Attributes of breakthrough products **(Deszca et al., 1999:625)**

Market/customer	New to customer (Lehmann, 1994; Lynn et al., 1996)
	Tied to emerging customer trends (Olson, 1994).
	Shift market structures to create new customers (Urban et al., 1996.
	Require customer learning, acculturation, and behavior change (Lehmann, 1994; Lynn et al., 1996; Urban et al., 1996)
	Longer diffusion process (Lehmann, 1994; Lynn et al., 1996).
	Create or expand a new category and/or create cross-category competition (Leeman and Winer, 1997.)
Product	Unpredictable evolution (Lehmann, 1994; Lynn et al., 1996).
	Exist outside current product hierarchy (Lehmann, 1994).
	Precede the establishment of a dominant design (Leonard-Barton, 1994; Lynn et al., 1996)
	Offer unique benefits (Olson, 1994).
Technology	Infrastructure creation or change may be necessary (Lynn et al., 1996; Urban et al., 1996.
	Represent or incorporate new, innovative technologies (Lynn et al., 1996; Urban et al., 1996).
	May embody new processes (Wheelwright and Clark, 1992)

Further research in BTPs are strategically important especially new product development in high technology industries **(Deszca et al1999)**.

A comparison could be made between the killer products and breakthrough products regarding the table 3.1. Both of them involve uncertainties and result from unpredictable evolution, besides they associated with technological improvements, open new categories or expand that product category. However, products differentiate from breakthrough products by being invasive and pervasive, killer products render obsolete the previous technology, force its rivals out of business, which are not stressed as attributions BTPs.

Breakthrough products was also issued by Cagan and Vogel Creating Breakthrough Products in 2002. According to **Cagan and Vogel (2002)** ``breakthrough products

result from appropriate combination of style and technology and help to create experiences that people find rewarding and valuable". There are interconnected factors such as social change, economic trends and technological innovation. They highlight the points including high level of technology and high level of style and called it moving to upright (figure 3.4). It is given Starbucks, as an breakthrough product example. Starbucks products are both high in technology and style comparing to a small local coffee shop.
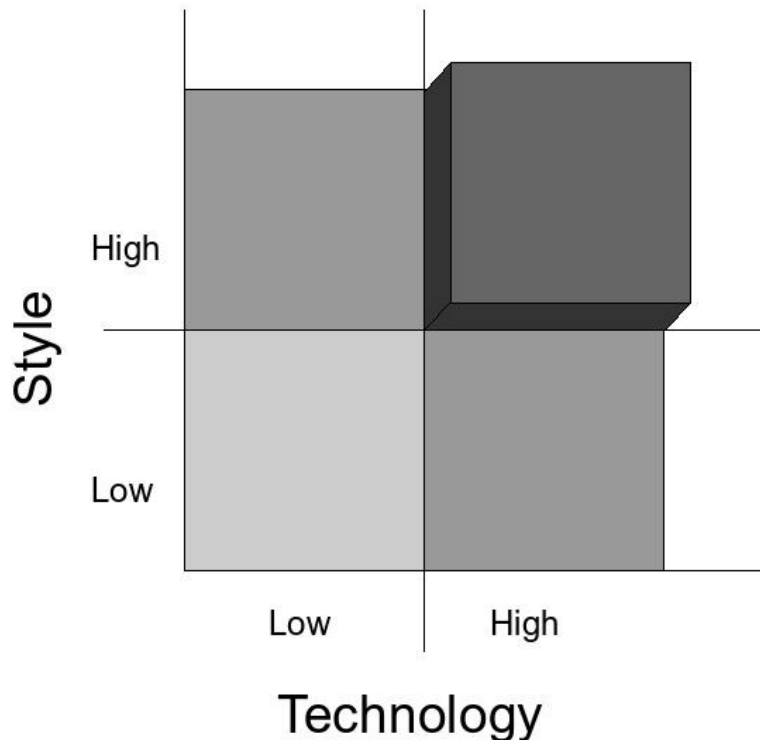
Figure 3.4: Moving to the Upper Right -Integration style and technology **(Cagan and Vogel, 2002)**

3.5 Level of Innovation of ``Killer Products"

This research does not primarily focus on sources of innovation. Nevertheless innovation levels, which killer products are created, is analyzed. Innovation is often characterized by its impact on existing markets or businesses.

Tushman et al stated (2000) as:

> "Innovation has been typically measured and conceptualized at the product level of analysis even as the empirical referent for both technical and organizational change has been at the subsystem level of analysis. For example, while Anderson and Tushman (1990), Christensen et al (1999), and Van de Ven and Garud (1994) discuss minicomputers, disk drives and hearing aids, respectively, their data are all at the subsystem level of analysis. Thus for any given innovation it is unclear whether organizational outcomes are driven by the locus of innovation, the characteristics of the innovation or both"

Innovation and technical change are at the core of killer products. The innovation level is high and aggressive. Innovation literature review has shown vagueness of definitions.   Given this conceptual confusion, innovation research confounds innovation characteristics, innovation types and the hierarchical locus of the innovation. With greater clarity on units of analysis and on innovation concepts and measures, research on innovation and organizational outcomes might be more cumulative and effective.

According to **Utterback and Jones (1975:642)** innovation defined as:

> "A product innovation is a new technology or combination of technologies introduced commercially to meet a user or a market need. As was the case with process development a basic idea underlying the proposed model of product innovation is that products will be developed over time in a predictable manner with initial emphasis on product performance, then emphasis on product variety and later emphasis on product standardization and costs. "

There are different types of innovation:

• Incremental innovation versus radical innovation

• Product innovation versus process innovation

• Competence enhancing Innovation versus competence destroying innovation

• Architectural innovation versus Component innovation.

3.5.1 Radical innovation versus incremental innovation

Incremental innovation is a modest type innovation which offers improvement, but is a follower innovation of a radical innovation. Radical innovation invades a particular market, replacing the older technologies. Killer innovation might be called as radical innovation "disruptive innovation" **(Christensen, 2003)** or breakthrough innovation.

A radical product innovation is a new product innovation that incorporates a substantially different core technology and provides substantially higher customer benefits relative to previous products in the industry **(Chandy and Tellis, 1998)**.

Typewriters, telegraphs and some other products are virtually extinct now. They were smart products and widespread; however, they are swept away by killer products. Why some technologies succeed other fails? **Chandy and Tellis (2000:1)** state the importance of radical product innovation because "radical product innovation is an engine of economic growth that has created entire industries and brought down giants while catapulting small firms to market leadership"

The theory of S-curves comes from the technology management literature and explains the origin and evolution of radical innovations **(Foster, 1986; Sahal, 1985; Utterback 1994; Utterback and Abernathy, 1975)**. According to S-curves theory,

technologies evolve along with the series of successive S-curves that drive various new product introductions **(Chandy and Tellis, 1998)**. The S-curve emerges when a new technology offers few consumer benefits when it is first introduced, offers rapidly increasing consumer benefits as it develops, and offers slowly increasing consumer benefits as the technology matures (figure 3.5).
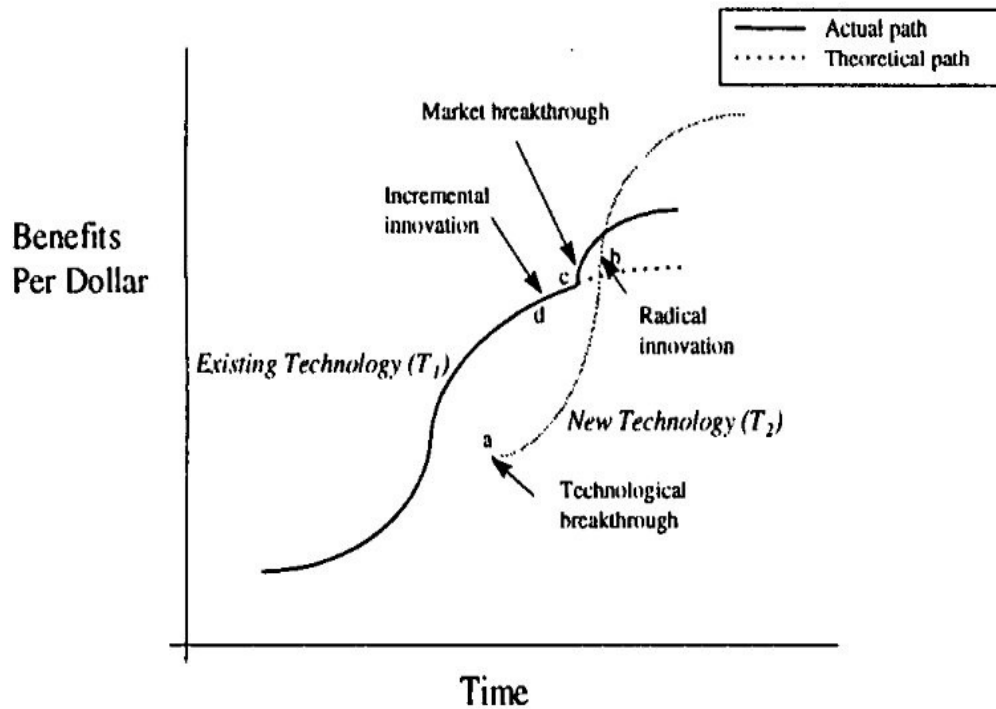
Figure 3.5: S-curves, **(Chandy and Tellis, 1998).**

3.5.2 Product versus process innovation

According to Meier and Baldwin **(1957; cited in Mutlu, 2003:22)**, there are five types of innovations that comprise the following two major categories considering Schumpeterian innovation:

> Process innovations:
> 1. A new method of production,
> 2. A new source of supply of raw material or semi- finished goods,
> Product innovations:
> 3. A new good,
> 4. A new quality of a good, opening a new market,
> 5. A new industry structure as the creation or destruction of a monopoly position

The pattern of relationships between a segment's stage of development and innovation might be conceptualized as shown in the figure 3.6. **Utterback and Abernathy stated (1975)** vertical axis demonstrates the changes in frequency of innovation. Relation to the stage of process and product development is

demonstrated on the horizontal axis. In this manner, this graph presents an orderly and even progression of product and process development, standardization and increase in sales volume. Process segments which exhibit the highest rates of improvement in productivity do indeed seem to progress rapidly through the stages indicated. But this is not necessarily the case for all process segments.
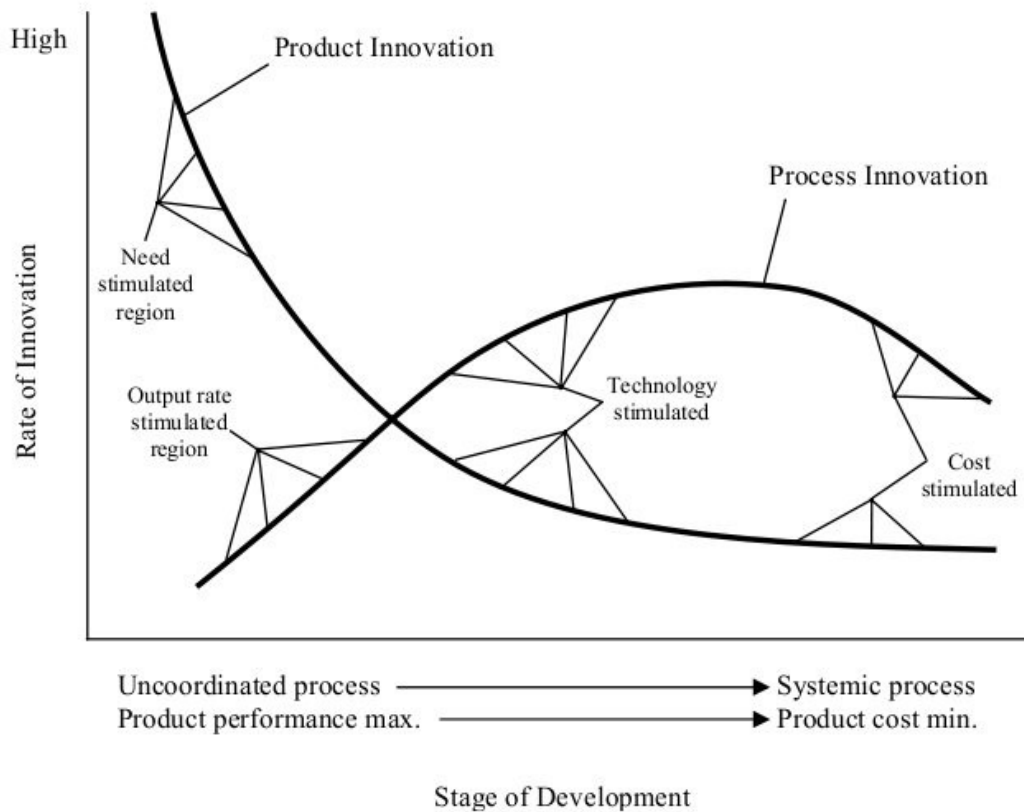
Figure 3.6: Product versus process innovation **(Utterback and Abernathy, 1975:645)**

3.5.3 Competence enhancing innovation versus competence destroying innovation

Competence destroying and competence enhancing are composed of two distinct constructs which, although correlated, separately characterize an innovation: new competence acquisition and competence enhancement/destruction.

An innovation is considered to be competence enhancing if the innovation builds on existing knowledge or skills of a firm or product which is a kind of cumulative innovation. For example, Pentium series of Intel (Pentium I, Pentium II) are new coming Pentium model depends on the shoulder of older one. On the other hand, an innovation is considered to be competence destroying, when the innovation does not build on existing knowledge or skills.

3.5.4 Architectural versus component innovation

Architectural innovation changes the entire design of a product, architectural innovation that changes the overall design of a system or the component innovation does no effect the overall system.

Metaphorically, it might be said that innovation breaks the rule and change the game but killer product innovation might conceptualize change the era, devastate/rewrite the rule.

3.5.5 Innovation level and designs

There is a parallel between design steps and the level of innovation. Radical innovation needs larger design steps. Killer products are result from radical innovation and larger design steps.

Rothwell and Gardiner (1988) connect the importance of incremental innovations to the high rates of technological change. According to them, during periods of high rates of technological change, there exist relatively few radical innovations in each industry. They discuss that once a radical innovation is introduced to the market, it leads to various incremental innovations, and major or minor re-design variations developed on the radical innovation. Figure 3.7 corresponds to their identification on the technical change, consisting a radical innovation and subsequent incremental innovation. When the level of innovation is increased the degree of innovation is increased.
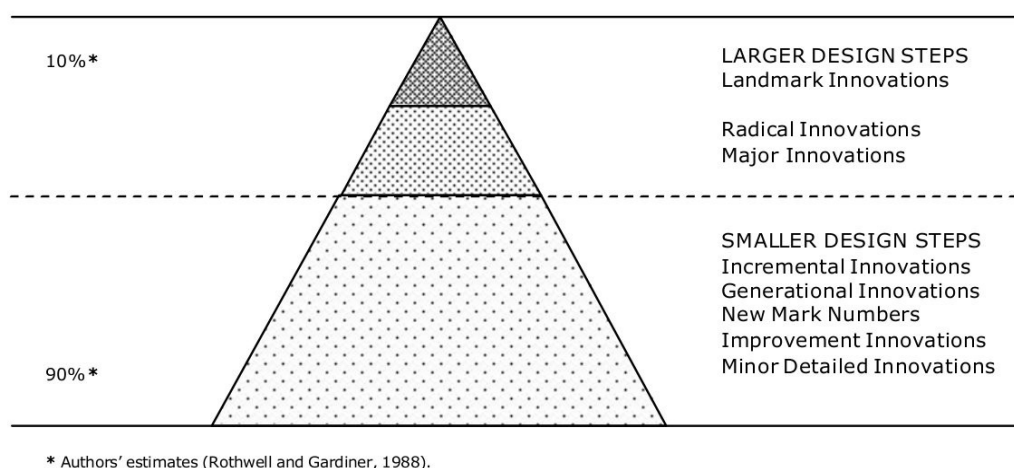
Figure 3.7: Technological change and design steps **(Rothwell and Gardiner, 1988)**

3.6 Conclusion

This chapter covers wide range of key words concerning the killer product idea. This literature review section has been identified some of the critical points of killer product history. Similarities and differences with the terms in the literature have been investigated, such as category killer and killer products. These comparisons have stressed the characteristic of killer product which is employed for building the definition.

Building the background information is starting with describing the environment of the killer products. New market, its dynamics and market evolution, killer terminology in literature in other words terminology related to the concept of killer product in literature is grounded on this part.

Understanding the market, new economic trends such as new market has been correlated with killer product foundation. Competition oriented market needs drives aggressiveness of the product. Finally, 'innovation' is examined as a process through which killer products are created.

The research does not focus on sources of innovation. Nevertheless levels of innovation, characterized by its impact on existing markets, are analyzed in relation to technical and organizational change of products to the what we call ``killer product''.

Orderliness of knowledge answers the purpose of building the background information and determine this term orientation in terminology. However, there exist unidentified questions concerning different kinds of innovation such as how are incremental innovations different from competence enhancing innovations **(Anderson and Tushman, 1990)**. Are architectural innovations different than disruptive innovation **(Christensen, 1997; Henderson and Clark, 1990)**. To what extent are innovations that involve changes in core subsystems the same as radical innovation **(Toushman and Murmann, 1998; Baldwin and Clark, 2000)**.

Following chapter focuses on analyzing killer product through analogy. It starts with introductory background information: evolution and evolutionary approaches; ideas are modeled on biology. Mapping features of killer product and *Caulerpa taxifolia* through examples. Finally, limitation of the analogical approached is discussed. Differences between market and ecosystem; *Caulerpa taxifolia* and products itemized.

4. ANALYZING THROUGH ANALOGY[1]

This chapter proposes to examine killer product through analogy. Firstly, analogical approaches used in different design fields are introduced. Secondly, appropriate similarities are chosen which are perceived to have the same role in both source: killer weed, *Caulerpa taxifolia*, and target: killer products. Various subsections are built representing properties and categories and dimensions of the killer product. Finally, differences between them are discussed thorough limitation of the analogy and they are examined in the section of limitation of the analogy.

4.1 Introduction

Our interaction with the nature differentiates in these days, we find out the richness as a source of novel ideas. Chaos, complexity, and interaction are important dynamics in understanding new ideas. "The biological research tradition has now acquired a richness and complexity" **(Saviotti and Metcalfe 1991)**. Charles Darwin evolution studies affect much of the related works in the field on the ground that evolutionary change was due to natural selection operating on variations within the population. Some species become extinct whereas others emerge and their number of surviving species is changing as well. The poorly adapted species perish whereas, the well adopted ones survive and pass on their beneficial genetic interpreting to their off-springs.

Evolutionary mechanisms such as concepts of spices, environment, habitat, niche besides to interactions such as competition, commercialism and predation could be adapted to concepts of economy and social sciences (**Saviotti and Metcalfe, 1991)**.

4.2 Evolutionary Approaches, Ideas are Modeled on Biology

> "Increasingly, design shares with biology a focus on information flow, on networks of actors operating at many levels, and exchanging the information needed to balance communities of systems" **(Dabberly, 2008:35)**.

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[1] Early version of this study has been presented on EAD 2007 and puplished (Gulari, 2008). Especially, most of this chapter can be found in the article.

The evolutionary approaches depend on theory of evolution. Evolution refers to the gradual appearance of all biological diversity. Technological change plays very influential part in development of evolutionary approach **(Saviotti and Metcalfe, 1991)**. Evolutionary approaches are widely used in applications in computer science, design process, economics and engineering. Simulations of evolution using evolutionary algorithms and artificial life were started with the work of Nils Aall Barricelli in the 1960s, and were extended by Alex Fraser, who published a series of papers on simulation of artificial selection. Artificial evolution became a widely recognized optimization method as a result of the work of Ingo Rechenberg in the 1960s and early 1970s, who used evolution strategies to solve complex engineering problems. Genetic algorithms in particular became popular through the writing of John Holland. As academic interest grew, dramatic increases in the power of computers allowed practical applications, including the automatic evolution of computer programs. Evolutionary algorithms are now used to solve multi-dimensional problems more efficiently than software produced by human designers and also to optimize the design of systems.

Key elements of Darwinian Evolution might be defined as mechanism of selection and generation of variety. Mechanism of selection affects the variety in product design. All different interactions in biology can be classified in three actions; competition, commensalism and predation **(Smith 1975; cited in Metcalfe and Saviotti, 1991)**. By its definition evolution is unpredictable. According to **Boulding (1981; cited in Saviotti and Metcalfe, 1991)** predictability is depend on stability in a system.

Evolution generates diversity and diversity generates variety **(Allen and Mcglade, 1987; cited in Metcalfe and Saviotti, 1991)**. Evolutionary theory seeks to include an explanation of the process which generates economic variety through product and process specification.

4.2.1 Evolutionary economics

Evolutionary economics is a relatively new economic methodology that is modeled on biology. Evolutionary economics is defined by Anderson.

- "a mechanism of preservation and transmission,
- a mechanism of variety-creation,
- a mechanism of selection, and which includes or may be enhanced by introducing
- a mechanism of segregation between different populations" **(Anderson, 2008)**

It stresses complex interdependencies, competition, growth, and resource constraints. Evolutionary economics as a terms is used in Nelson and Winter's book in 1982, ``*An Evolutionary Theory of Economic Change*'' for the first time in indexes, which is one of the major contributions to the emerging field of evolutionary economics as well.

4.2.2 Evolutionary design

Langrish (2004:5) states evolutionary approach to design, ``Design evolution is the evolution of ideas, and the Darwinian evolution of ideas is called "memetics" from the concept of self-replicating ideas called memes by Richard Dawkins''.

Langrish (2004), in his paper Darwinian design: the memetic evolution of design ideas, rejected Forty ideas against evolution on the ground that, Forty's understanding of evolution is Spencerian, however; Forty's arguments are not against ``Darwinian change''. He uses the term Darwinian change rather than Darwinian evolution.

> "The original full title of his great work was On the Origin of Species by Means of Natural Selection—nothing about "evolution." In fact, the word "evolution" is only used once in the first edition. He originally intended to call this work just "Natural Selection," and a Darwinian theory is one based on natural selection—not on some inevitable force for progress" **(Langrish 2004:4)**.

Extinction might be defined as the disappearance of an entire species. It seems that extinction is seldom and odd event, nevertheless it is not an unusual. Indeed, virtually many animal and plant species that have lived on earth are now extinct. Extinction is a key word that we question for killer products. Does killer product lead to extinction?

4.2.3 Biomimicry

The word "biomimicry" comes from the Greek words bios (life) and mimesis (imitation). Biomimicry, a new way of viewing and valuing nature, is introduced by Janine Benyus, in *Biomimicry: Innovation Inspired by Nature*, 2002. As a biologist, Benyus explains the basic thesis of nature based innovations which is a great contribution to biomimicric studies **(Wolf, 2005)**. Her ideas based on what we can learn from the nature rather than what we can extract from it. Biomimicry takes advantage of evolutionary process and biological understanding of nature.

According to **Biomimicry Guild (2008)** biomimicry is defined as fallows.

> "Biomimicry is an innovation method that seeks sustainable solutions by emulating nature's time-tested patterns and strategies, e.g., a solar cell inspired by a leaf. The goal is to create products, processes, and policies---new ways of living---that are well-adapted to life on earth over the long haul."

Biomimicry studies nature's models. These models are taken as inspirations to be used as a problem solving method in the field of design and engineering. The aim is intensively look for new and improved ideas and products. In this process, natural systems are functionally modeled and then these principles of the natural system are transferred to an engineered system or a product.

In short, biomimics imitates nature. This new approach in design and engineering make use of not only products, materials of nature but also nature's processes. There are three primary areas of biomimicry includes using nature as a model, a standard of measure, and as a mentor.

Natural selection resulted in mechanisms and structures that are extremely refined and ingenious, since optimal variants become extinct. Some of these natural systems are analyzed, copied and integrated in materials, enabling an enormous range of new improved products and applications to come into being.

Tinsley et al claim **(2007)** biomimetic solutions could be found through searching the fuction where a solution is needed. "A biomimetic function-based repository enables learning, practicing and researching designers to fully leverage the elegance and insight of the natural world" **(Tinsley et al, 2007:1)**.

Biomimicry guild (2008) identifies in which areas and processes is biomimicry helpful.

> "Heighten existing product categories: Biomimicry helps you see stale product categories in a radically different light. This new sight creates an opportunity for innovation.
>
> Define new product categories and industries: Biomimicry can help you create disruptive technologies that transform your industry or help you build entirely new industries.
>
> Drive Revenue: Biomimicry can help you create whole new growth areas, reignite stale product categories and attract both customers who care about innovation and sustainability." (**Biomimicry guild, 2008**)

These descriptions overlap with the expectation from killer product. Biomimicric innovation -approach- is willing to create killer product.

4.3 Similarities of the `Killer Product' and the 'Killer Weed' (Caulerpa taxifolia)

This section focuses on select and match relational patterns by comparison and contrast killer weed and killer products. Analogical reasoning is used as a problem solving method to realize killer product.

> "What cognitive capabilities underlie our fundamental human achievements? Although a complete answer remains elusive, one basic component is a special kind of symbolic ability – the ability to pick out patterns, to identify recurrences of these patterns despite variation in the elements that compose them, to form concepts that abstract and reify these patterns, and to express these concepts in language. Analogy, in its most general sense, is this ability to think about relational patterns" **(Holyoak, Gentner and Kokinov, 2001)**.

The concept of the killer product as itself is difficult to define. Offering a method to explain killer products is also a difficult task. On the other hand the market place and ecosystem have common characteristics. The detailed examination of killer products by building an analogy between the killer weed; *Caulerpa taxifolia* and killer products is promising. Although *Caulerpa taxifolia* is a weed that is certainly unwanted and harmful to the ecosystem entirely, killer products are often desirable, and their effects are reasonably complex. However the parallel between them are considerably appealing and informative. Identifying these basic features constitutes a starting point for determining role of design in creating killer products.

4.3.1 Accidentalness

Caulerpa taxifolia, commonly used for aquarium ornamentation, was accidentally released to coastal waters of Mediterranean where it turns to killer algae **(Meinesz et al, 1993)**.

Drivers of innovation are sometimes matter of luck and accidents **(Geroski, 2003)**. Changing the environment of a product, its habitat might turn it to an amazingly successful product. Pfizer originally produced Viagra as a medicine for heart conditions. Accidentally, side effects were discovered that made it a widely known treatment for male sexual dysfunction. Nevertheless, it is essential to recognize the reasons behind this accident: what similarities and differences between environments or intended users that produce something different. "Post it" notes and aspartame are also examples of accidentally developed successful products **(Geroski, 2003)**. Play dough was an in-deliberately developed product, which is a kind synthetic plastic primarily designed to use at war. Microwave oven is also unintentionally developed by Percy Spencer which become highly widespread technology and become indispensable for us.

Gary Kildall Case is a widely known story of operating system dominance. **Schilling (2008)** explains that IBM was the biggest computer producer till 1980 but they underestimated the personal computer industry, they assumed that personal computers would not go beyond of small niche of hobbyist. So it was late for IBM for developing an operating system (OS) for PC. Therefore, IBM wanted to offer Kildall to develop an OS. At that time Kildall was the owner of Digital Research company and had the dominant operating system CP/M. Kildall did not make contract with IBM. Various reasons have been given for the two companies failing to reach an agreement. It is also claimed that the agreement failed due to coincedental reasons. Consequently, IBM did this contract rather with Bill Gates, and his small company

Microsoft. It might be stated as a matter of luck. Therefore, it is a good question to consider ``how might computing industry look different if Gary Kildall has signed with IBM'' or ``Microsoft dominance in the market is due to luck?''**(Schilling, 2008)**.

4.3.2 Pervasiveness

Caulerpa taxifolia is pervasive. It is the fastest-growing seaweed in the world and covers the sea bed like a thick blanket. It is capable of extremely rapid growth; up to 1 cm per day **(Borum et al., 2004)**.

Killer products are easily mass produced in large numbers. Moreover distribution channels are powerful and their growth appears to "snowball". Internet; world-wide network, Microsoft products are used to control virtually all of the world's PCs and laptop computers (albeit smaller shares of mobile phones, hand-held and server computers). Wintel computers, Windows working with Intel computers are ubiquitous for example.

Figure 4.1 represents the market share of desktop operating systems. As reported by **Net Application (2008)** Windows dominates %91.46 of the market.
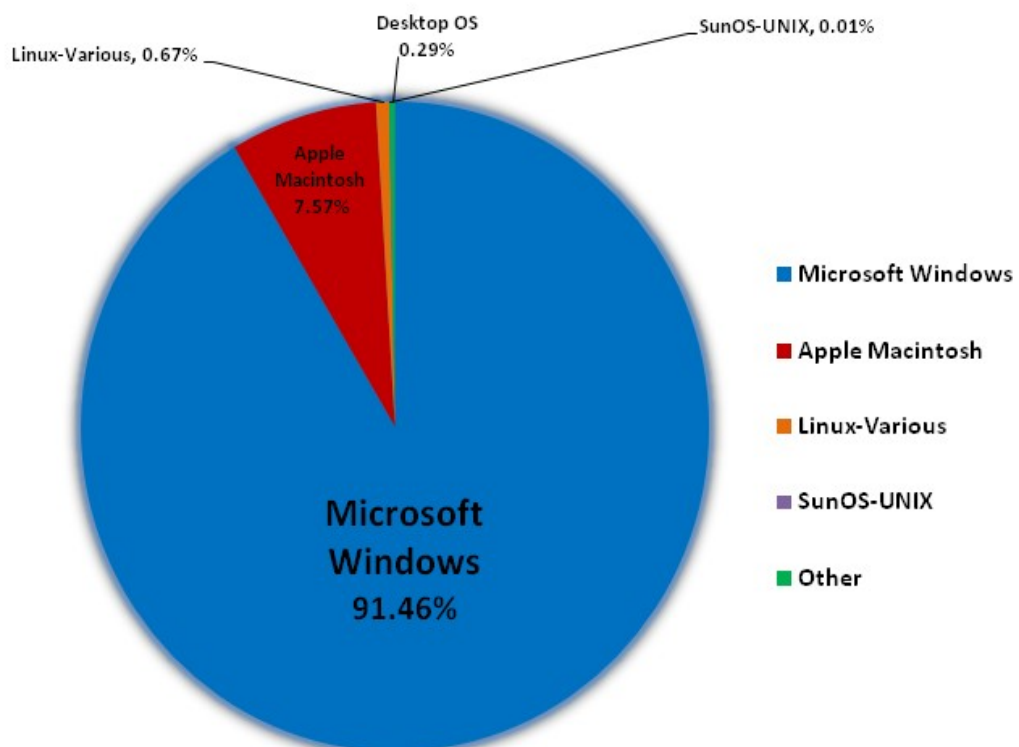
Figure 4.1: Market share of desktop operating systems **(Net Applications, 2008)**

We can describe killer products pervasiveness with positive feedback and network effect.

4.3.2.1 Positive feedback and network, system effect

Positive feedback is a system response sometimes called as the snowball effect; a situation where reinforcing a process causes it to move even more in the same direction. For instance, products attract users, which lead to an increase in perceived product value, which in turn leads to more users being attracted to the product.

One common example of positive feedback is the network effect, which is: "The phenomenon whereby a service becomes more valuable as more people use it, thereby encouraging ever-increasing numbers of adopters" **(Crucial Marketing, 2007)**. Where more people are encouraged to be a part of a system or have the product, the association becomes larger. The result is that the network grows more and more quickly over time that leads to higher distortion.

Robert Metcalfe formulated a law related to the network effect, stating that the value of a telecommunications network is proportional to the square of the number of users of the system (n2). First formulated in regard to Ethernet, Metcalfe's law explains various network effects of communication technologies and networks such as the Internet and World Wide Web.

The example of fax machines is used to illustrate the Metcalfe's law (figure 4.2). A single fax machine is useless. However, the potential usefulness of every fax machine increases with the sum of fax machines in the network as the number of users who may send and receive documents increases.
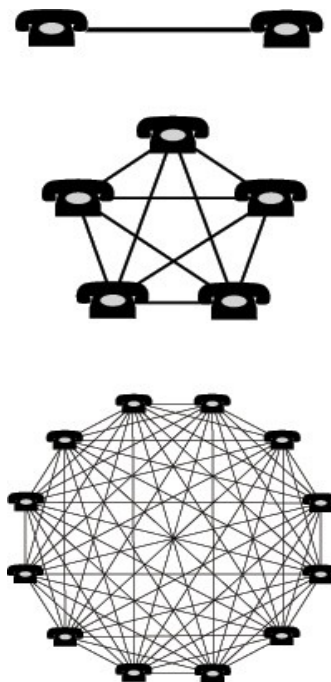
Figure 4.2: Network effect **(Coetzee, D., 2006)**

"In all cases the use of common standards plays a critical role in linking network users" **(Stenborg, 2002:3)**. In addition, users might easily exchange data (Word documents, spread sheets) and sell the output more easily when there is a common standard. Moreover, design education in schools is affected by this positive feedback. School computers are donated by producers of particular software programs, as an answer to professional work expectations. Students are educated with these dominant software programs making them even more widespread after they graduate.

The network effect helps to reinforce the leadership position of firms. Software developers tend design programs for killer brands like software to sell their outputs more easily, therefore making it difficult for small firms to survive unless the significant product innovation occurs.

4.3.3 Suffocating

Caulerpa taxifolia is invasive, competes for space. First it disorders, then replaces and dominates the flora **(Meinesz et al., 1993)**. Ecologists are worried because the killer weed is choking off food that sustains fish and sea birds, forcing many species to leave their home grounds and forage elsewhere **(Madl and Yip, 2005)**.

Killer products are invasive and they create monopolies. Killer alga consumes all the resources of the sea floor, similarly killer product takes the advantage of the using the resources in its sector, like raw material, distribution channels. Besides, killer products attract all the attention of the producers, consumers, retailers and complementary goods and services.

4.3.4 Particularity

Caulerpa taxifolia was not killer in warm water however it turns into a killer species in colder water like Mediterranean. It has been discovered off the coasts of Australia and the United States, although none of those encroachments are anywhere near the scale of what is happening in the Mediterranean **(Borum et al., 2004)**.

A product is killer in a niche market. "A dominant design needs to be established in a particular market" **(Geroski, 2003:127)**. "The products based on the disruptive technology initially only satisfy a niche market segment, which values dimensions of performance on which the disruptive technology does excel." **(Danneels, 2004:247)**. For example, pervasive mp3 player, iPod, is very important, but only for its target user.

4.3.5 Dominance

Plant and animal diversity and abundance are reduced where *Caulerpa taxifolia* has invaded. The aquarium strain of it has been documented to displace native vegetation, particularly sea grass beds, and become the dominant plant life **(Madl and Yip, 2005)**.

"Dominant products are an important part of the story evolution of new markets because they are the result of a process of standardization which drastically reduces product variety" **(Geroski, 2003:122)**. Their success might be harmful to market ecosystem. An example might be from QWERTY keyboard. The computer keyboard originated from the typewriter; the standard typewriter keyboard (nicknamed QWERTY) was designed over a century ago. The type-bar system and the universal keyboard were the machine's novelty, but the keys jammed easily. To solve the jamming problem, another business associate, James Densmore, suggested splitting up keys for letters commonly used together to slow down typing **(Science Museum, 2008)**. This became today's standard "QWERTY" keyboard and now is used for to write fast. "QWERTY has become a controversial issue, because many individuals feel that the sequential keyboard market is being monopolized by a sub-optimum layout" **(Noyes, 1983)**.

QWERTY introduces the concept of layout design. On the other hand, now it does not let any lay-out design to grow in the market because it has become the standard everywhere. After QWERTY, many competing keyboards layout were released; however, since QWERTY dominating the market and become standard other keyboard layouts fail. Different kind of advantageous solutions to keyboard arrangement might available such as alphabetical order which make easier learning process or keyboard layout design letters that most commonly used group together writing fast.

QWERTY keyboard is a special case since it is not shaped by the design identity of a brand. It is depending on an old solution, designed for typewriters, lead to inefficient typing problem today. A design deficiency of QWERTY is the inequality between left and write hand use. 3000 English words can be typed with left hand alone, while only 300 can be only typed with right hand alone. Formerly this positioning produce slowdown writing was useful for jamming case. Ironically, Sholes experiments to solve problems of typewriters are the standards of today. QWERTY design is a good example changing the habitat of a product where it was originally designed for mechanic typewriters and used for digital typing tools. This is similar to the weed, *Caulerpa taxifolia* is originally used for aquarium ornament.

For instance Dvorak layout (figure 4.3) is a widely known alternative layout for QWERTY developed by Dr. August Dvorak, an educational psychologist and professor of education at the University of Washington in Seattle, he took the patent of Dvorak layout in 1936.

Figure 4.3: Dvorak

Today's technological availability, it is meaningful to design a keyboard depending on language; in terms of mostly used letters arranged closely. The "F keyboard" (figure 4.4) is a Turkish keyboard layout designed for efficient typing in Turkish language, a general winner of typing contest **(Kuyumcu, 2005)**.

Figure 4.4: F keyboard

The keyboard was designed by determining which letters combined together, and how often. However; it is hard to find even in Turkey since QWERTY keyboard is so pervasive. F keyboards for desktop computers exist, but hardly any on laptop computers.

4.3.6 Aggression, invasiveness

Caulerpa taxifolia, a highly invasive weed, produces large amounts of toxins that harm competitors **(Ruesink, Collado-Vide, 2004)**.

Killer product limits the growth in a system by fixing prices or preventing competitors from distributing their products. Certainly, there are antitrust regulations to prevent market domination by a single firm. For example, in 2006 Microsoft released an Mp3 player; "Zune" with such aggression that they advertised it as the "new enemy" and "iPod killer" **(Zunescene, 2006)**.

Microsoft also does not let new entrants in the market. A big battle exists in the operating system arena between MS Windows and Linux. Microsoft products are specifically made not to be compatible with Free Software. Moreover, Microsoft co-operates with other software giants to make their software compatible only with MS Windows.

Unlike many other media players, iPod was designed not to play music files from other competing music stores. Napster or MSN Music use rival DRM technologies like Microsoft's protected WMA or RealNetworks' Helix DRM. Moreover alternative royalty free audio formats such as Ogg Vorbis and FLAC are not supported, possibly because they are developed by media standards bodies of which Apple is not a member. Not supporting particular formats is actually a way of releasing toxins. Furthermore iPod offers a converter for non-DRM WMA files, which is provided with the Windows version of iTunes. This is called displacement.

4.4 Limitation of the Analogy

Analogical method is built between source and target domains, principles from a familiar domain -source domain- are employed to understand an unfamiliar domain -target domain- **(Yanawitz, 2001; Halyoak et al., 2001, Halyoak and Koh, 1987)**. **Yanowitz (2001)** stated ``although two domains -target and source- may share some similar relational structures, they can vary in the amount and type of structural relationships they have in common'' **(pp.547-548)**.

The list of analogies used in thesis:

1. Product and Species

2. Product life cycle and Living phases

3. Market place and Eco-system

4. Technological change and Evolution

There are three factors hindering the application of natural mechanisms of the killer product idea:

1. There was no systematic list of natural mechanisms that could be used in understanding killer products;

2. The mechanisms of natural properties are often unknown;

3. It is not always technically possible to integrate the natural analogies to the concept of killer product.

One of the main goals of doing analysis through analogy is to make a list of mechanism in nature that could be applied in understanding killer product idea. Besides, select and evaluate some of these natural mechanisms especially mechanism of *Caulerpa taxifolia* in this process. However, not only the correlation between killer weed and killer products is limited but also, in a more comprehensive understanding, the connection between market and biological ecosystem is limited.

"The problem with the natural selection approach is that it accounting for individual character traits, dispositions and so on by reference to their survival values, it deprives individual choices and purposes of their place at the terminal level of social explanations" **(Gray, 1984:53; cited in Hodgoson, 1991:108)**. When it comes to differences, it is obvious that there are lots of differences; otherwise it would be ambiguous. Differences seem to weak the subject of exploration but considering the limited resemblances, distinctions evaluate the similarities, approve the realization of the research.

To begin with the pace of time works differently in evolutionary biology. The change in market, economy and design is so much faster than the change in evolution. In addition products, directly related to human being, who are affected by social culture and economic life, are in a rapid change. However in biological world, the elements of chance are confined to adaptation and mutation.

Another difference is also a controversial issue is that Lamarck believed that an organism has an instinct to evolve towards more complex forms, inheritance of acquired characters. Product Design Evolution for progression acquired characteristic can be inherited, and evolve towards to better, improved products. However, Darwinian understanding of evolution that is the evolutionary change depends on natural selection. **Charles Darwin** explains his theory, *in the Origins of Species* **(1859)**, he claims that mechanism of evolutionary change depends on

nature selection. He states no mechanism for maintenance of variety. Darwin claims that the natural selection mechanism could not pass to off-springs. **Forty (1986**) argued that products are different than the living species, since products do not have a life their own. He stated that:

> "Historians of design have often tried to get around the problem [of explanations involving creative individuals] by attributing the changes to some sort of evolutionary process, as if manufactured goods were plants or animals. Changes in design are described as if they were mutations in the development of products, stages in a progressive evolution towards their most perfect form. But artifacts do not have a life of their own, and there is no evidence for a law of natural or mechanical selection to propel them in the direction of progress. The design of manufactured goods is determined not by some internal genetic structure but by the people and the industries that make them and the relationships of these people and industries to the society in which the products are to be sold" **(Forty, 1986:8)**.

Notion of consciousness is animportant aspect of the limitation of biological analogy. Some distinctions remain such as the notion of intentionality, purposefulness or choice. Killer products result from artificial selection rather than natural selection since intelligent agency does the job of selecting organisms to reproduce. As for adaptation process, intentional adaptation takes places random unintentional adaptation.

As **Karl Marx (1976:284)** stated, ``what distinguishes the worst architect from the best bee is that the architect builds cell in his mind before he construct the wax'' .

The purposefulness needs to be considered as an important element of limitation. Evolution has no purpose a living thing has no purpose other than staying alive and reproduction. Natural selection and evolution has no purpose, natural selection is blind **(Dawkins, 1986)**.

> "The fundamental contrast between biological and economic world is that in the latter, the generation of variety is purposeful. Firms deliberately seek differentiate themselves from rivals through milted of types of product and process innovations, and while this process undoubtedly contains random elements it is also shaped by the environment in which firms operate" **(Metcalfe and Saviotti, 1991:11)**

Killer product has a purpose, in other words the environment of killer product, market ecosystem has a purpose which is a fundamental contrast between killer product and *Caulerpa taxifolia*, the killer weed.

Random elements shaped by the market environment and firms are affected by the intention of renowned and competition enhancement. Designs are selected for what they are not for what they become. Killer products are purchased by the consumers for their current situation. Consumers are affected by the brand identity and service advantage.

Table 4.1 summarizes the differences between market ecosystem and biological ecosystem. This list of items is also a comparison of the design field to evolutionary biology. Design is a strong distinguisher of these aspects. Left column is

differentiated by the process of design. The difference between artificial selection rand natural selection is the human decision. The intelligent agency does the job of selecting organisms to reproduce, this intelligent agency driven by the design.

Table 4.1: Comparison of market ecosystem and biological ecosystem

Market Ecosystem	Biological Ecosystem
Evolutionary change is fast	Evolutionary change is slow
Artificial selection	Natural Selection
Conscious	Non-conscious
Purposeful	Non-purposeful
Intentional adaptation	Adaptation
Choice	Random elements

5. DEFINITION AND IMPORTANCE KILLER PRODUCTS

This chapter aims to declare a formal explanation of the signification of killer product and highlight the importance of it as a term. The purpose is to build a structural approach to reach a precise and distinct definition for the 'killer product' concept. Firstly, previous usages of killer product phrase in literature are discussed to better describe the subject. Secondly, the definition of killer product is attempted. Properties, types, dimensions of killer product and their organizational effects are. aimed to identify.

5.1 What is a Killer Product?

5.1.1 Discussion of the early usages of the ``killer product''

The literature review has shown that there exists no established definition of the killer product. Works, in which the phrase of ``killer product'' has been used, lack empirical results or do not consider fundamental concepts. Description of the killer product remains confused and ambiguous. The analysis and correlations have insufficient precision. They are not rigorous, often inconsistent or difficult to reconcile.

Further details of the studies involving the ``killer product'' phrase are discussed below. To begin with, the phrase of ``killer product'' is excerpted from the abstract part of Chang's article *Sun Tzu and Quantum Information — a strategic View for the Information Technique of Tomorrow,* **Chang (2005:730)** states:

> "Inspired by our study of quantum information patents, we obtain a model for the power of market penetration and show that only with sustainable devoted efforts in science exploration based upon philosophy and culture, can we get the technology breakthrough and the killer product with the power to overwhelm the market while such a technology breakthrough is the object which should be protected as a patent or other form of IPR".

His paper has concerned quantum information, patents and intellectual property. Market penetration is maintained by protecting the information. Second usage of the term ``killer product'' is in the section named The Power to Penetrate a Market. He believes that, culture, philosophy, science and technology integrates years by years and finally produce the killer product (figure 5.1).
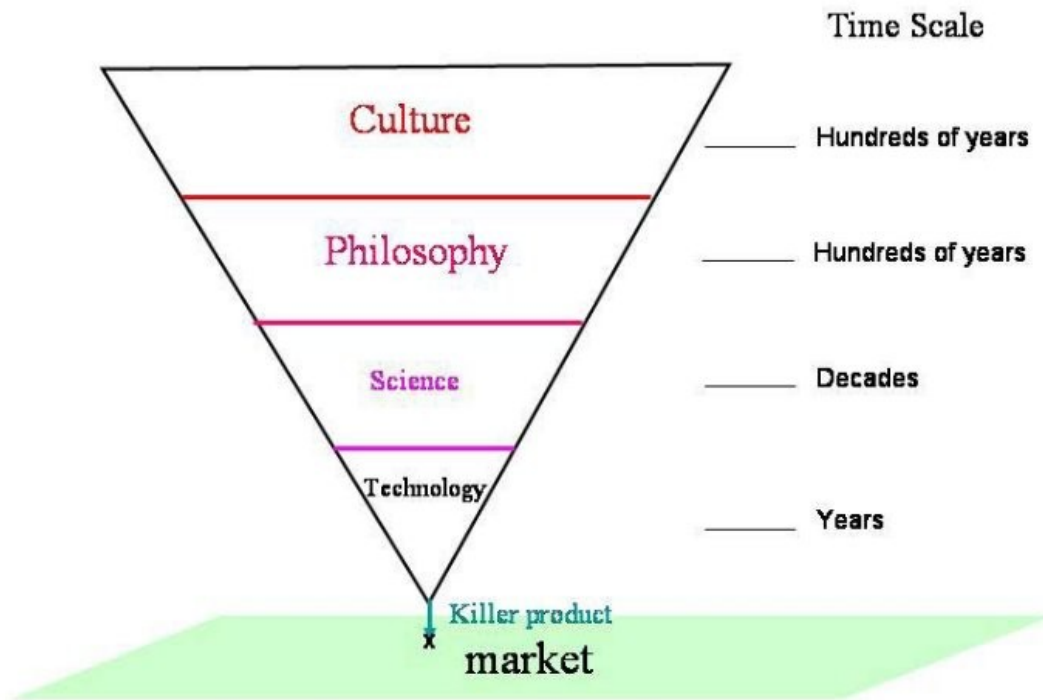
Figure 5.1: The market penetration **(Chang, 2005:734)**

Chang (2005:734) explained that

> "The culture, philosophy and science in this model are all human-oriented and time-oriented. There is no royal way to market success. Only when we have look into the culture, understand the philosophy, and devoted in science exploration, can we come to some technology breakthrough and make it into a killer product to achieve market success. Such a model will call for a renovation on the management concept in the era of knowledge economy".

Product development process, in its nature, concerns culture, philosophy, science and technology. Killer products, on the other hand, are bound to market dynamics, competitiveness and random factors which are missing in his diagram. His arguments are not related to the definition and process of killer products that is mentioned in the study.

Secondly, Dotson's article *10 Ways to Create a Killer Product!*' might be discussed in this study.

> "1. Solve an existing problem for people. There are thousands of problems in the world. Create a product that can provide a solution to one of those problems.
>
> 2. Find out what's the current hot trend. You can find out what the new trends are by watching T.V, reading magazines and surfing the net. Just create a product that's related to the current hot trend.
>
> 3. Improve a product that is already on the market. You see products at home, in ads, at stores etc. Just take a product that's already out there and improve it.
>
> 4. Create a new niche for a current product. You can set yourself apart from your competition by creating a niche. Your product could be faster, bigger, smaller, or quicker than your competitor's product.

5. Add on to an existing product. You could package your current product with other related products. For example, you could package a football with a team jersey and football cards.

6. Reincarnate an older product. Maybe you have a book that's out of print and is no longer being sold. You could change the title, design a new front cover, and bring some of the old content up to date.

7. Ask your current customers. You could contact some of your existing customers by phone or e-mail and ask them what kind of new products they would like to see on the market.

8. Combine two or more products together to create a new one. For example, you could take a brief case and add a thermos compartment inside to keep a drink hot or cold.

9. Survey the people who visit your web site. You could post a survey or questionnaire on your web site. Ask visitors what kind of products they would like to see on the market.

10. You could create a new market for your existing product. For example, if you're selling plastic bottles to a pop company, you could turn around and sell those bottles to a fruit drink company" **(Dotson, 2008)**.

Solving an existing problem, combining two or more product to create a new one, following the hot trends are the steps that are conventional for any product development process. But in this research we are not looking for generic suggestions. We rather emphasize a definition for killer product. There is no attempt to define the killer product. Besides, these steps are rather improvements, unexceptional, regular suggestions especially for small investments. On the other hand, the concept of killer product stands on invasive and pervasive state of product. Furthermore, it is important to emphasize competition. These ten steps do not stress these traits of killer product. For example, "you can create a new market for your existing market, For example, if you're selling plastic bottles to a pop company, you could turn around and sell those bottles to a fruit drink" but killer products open new categories by rendering the existing technology obsolete.

Another example is that **Knowles (2008)** offers in his web page ways to create killer products.

"Here's how you can create killer products.

There are 3 rules that you should follow: 1. Always Ask First 2. Create An Outline 3. The Big Idea - What Is Your Unique Selling Point (USP)"

Knowles approach is quite parallel with Dotson's suggestions. Always ask first means, first thing you need to know is what your customers want. Second step is to create an outline; plan your ideas. Third step, "the big idea - what is your unique selling point", is connected to the approach of finding killer product. The key words of unique, big idea related to creating killer products that is described in this dissertation.

Both of Dotson's and Knowles' suggestions are kind of easy to apply, cheap, sure-fire retailing tactics, which are also similar to Feltenstein's book, *401 Killer Marketing Tactics to Increase Sales, Maximize Profits, and Stomp Your Competitions*.

Another `killer product' usage is *Creating a Killer Product*, which is a book excerpt from *"The Innovator's Solution"* that Forbes Magazine has published online **(Christensen and Raynor, 2003)**. "How do you create products that customers want to buy--ones that become so successful they "disrupt" the market? It's not easy. Three in five new-product-development efforts are scuttled before they ever reach the market. Of the ones that do see the light of day, 40% never become profitable and simply disappear" **(Christensen and Raynor, 2003)**.

Christensen's approach in the "disrupt the market" is a parallel to the invasive trait of killer product. **Christensen (2003)** points into the non-consumers, creating a product for consumers who didn't even know they wanted until it was in the marketplace. Sony Walkman, Internet-based computers, wireless phones, credit cards, McDonald's, Coca-Cola, cut-price retail stores, Viagra and Botox are prime examples. He believes that when the product development process is held conveniently and predictably, it is difficult to reach a successful product to disrupt the market.

The phrase of killer product is marked only on the title, not repeated in the article. In the work, there is an explanation for creating a killer product but there is no clarity for what killer product is. It could be extracted from the work that these killer products are successful in disrupting the market, they are exceptional, unpredictable and targeted the non-consumer and customers want to buy.

This research does not intend to work as a guidance study or a recipe study to be applied to product development process step by step fashion such as Dotson's or Knowles' works. These usages are limited in providing a definition of the killer product idea but the dissertation has aimed to answer for what killer product is.

5.1.2 Definition

Firstly, a definition of `killer' might be given as "an impressive, formidable, or excellent person or thing; one who kills". It is described as "Very effective; excellent, sensational" **(Oxford English Dictionary online, 2008)**.

Secondly, the weed is a plant, frequently wild and unwanted. A critical aspect about killer weed is that human actions can turn a plant to a weed by transferring it to a habitat where no natural grazing predators are living; and they will compete with other plants for resources.

In addition definition of a product very drafty might be described as "a device that provides a service that enhances human experience" **(Cagan and Vogel, 2002:7)**. It

might be an issue is to define what service is, a service is an activity that enhances experience; it requires an array of products to deliver its core activity. Killer products might be physical products or services. Following these descriptions, a definition for killer product might be formed.

A coherent definition of the killer product is hard to formalize; however, it can be defined as a killer product is an invasive product that disorders its particular market by covering a very large space. This might happen because of introducing something significant such as a new technology, feature, function or user group. A killer product mainly forces its rivals to gradually disappear because not enough free space remains in the market or their technology is no longer needed. This aggressive characteristic results from imposing its own standards on the market and the users. These products are generally desirable or successful in their particular market. They might be smart, technologically innovative, and easily mass produced in large numbers. They are not always icons of design but they usually have the potential to be turned into a design icon.

Certainly, some pervasive design icons are not example to invasive products, such as a very well known design icon, Philippe Starck's lemon squeezer, 1990. It is considered an icon of industrial design is exhibited in museums. This product is iconic for design society, it is a niche product, and certainly not invasive to force it rivals to disappear.

Ford Model T and iPod, on the other hand, are examples to both being a design icon and killer product at the same time. Ford Model T was celebrated 100th anniversary, awarded as 20st century's automobile by 133 automobile journalists in December 18, 1999.

> "The COTC (Car of the century) award represents the hard work of many people from all over the world," said Fred van der Vlugt, chairman of the board of the Global Automotive Elections Foundation. "We salute the Ford Model T for winning this award" **(Wright, 1999)**.

Being a cultural and industrial icon is result from pervasive and invasive traits of iPod and Ford Model T. According to **Bull (2006:148)**, iPod seems to be 21s century design icon.

> "Yet just as Barthes had reduced the size cultural icon of the 1950s from that of a Gothic cathedral to that of a five seater automobile, so at the beginning of the 21st century, the cathedral of sound now exists in the head and mind of the iPod user - the spaces of culture have been redrawn into a largely, but not exclusively private, and mobile, auditory worship. The Apple iPod appears to be the 21st century's first cultural icon and as such a potent metaphor for much urban life".

5.1.3 Properties

In the following subsections, various characteristic of killer products are explored regarding market, user and society.

5.1.3.1 Killer products create new categories

One significant feature of killer products is that they open new categories in the market therefore owners of these products become early leaders. **Bonaccors**i **(2006:2)** states, "radical product innovation can generate entire new industries, as in the case of the PC, low cost airlines, or mobile communication, but also can sustain the competitive advantage of innovative firms in established industries, as in the case of iPod in the entertainment industry, or Geox in footwear". **Spendale (2003)** declares "technological discontinuities such as biotechnology and digital wireless communications shake the competitive environment, destroy the basis of established competitive advantages, create new competitive positions and open up opportunities of strategic renewal" **(p:254)**.

5.1.3.2 Killer products make money

Winners get large market shares and high profits for a while **(Evans, Schmalensee, 2002)**. Sony Playstation shows the huge economic power of a successful product that is a globally number one brand, competing against Microsoft and Nintendo and even others.

> "By 1999 (according to BBC website) it was making more money for the company than all its other computer electronics products combined, and had sold more than 50 million units worldwide- a staggering achievements within five years of launch particularly for a company with no games heritage when it launched its first product. Today Playstation continues to be number one brand worldwide despite increasingly hot competition from Nintendo and Microsoft and even from new entrants like Nokia" **(Milligan and Smith, 2006 cited in Gürşimşek, 2007:85)**.

Table 5.1 represents top 20 companies ranked by market value in billions of dollars as of December 31, 1970, 1985, and 2000. Fact set collects financial data from the 10-Qof the firms with out standing securities publicly on all U.S. Market **(Fact Set Research Systems inc, 2001; cited in Evans and Schmalensee, 2002:4)**.

Regarding this table, it is possible to draw a conclusion representing killer product's success.

As an example, we may consider the PC, 1980s killer product. IBM instantly became the natural market leader. However PC lost its killer effect and rivals adapted to the technology. This was followed by IBM losing its position by 2000.

Table 5.1: Top 20 Companies ranked by Market Value **(Fact Set Research Systems inc, 2001; cited in Evans and Schmalensee, 2002:4)**

Rank	1970 Company	Market value	1985 Company	Market value	2000 Company	Market value
1	IBM Corp.	$36.4	IBM Corp.	$95.7	General Electric Co.	$475.0
2	AT&T Corp.	$26.8	Exxon Corp.	$40.3	Exxon Mobil Corp.	$302.2
3	General Motors Corp.	$23.0	General Electric Co.	$33.2	Pfizer Inc.	$290.2
4	Exxon Corp.	$16.4	AT&T Corp.	$26.7	Cisco Systems Inc.	$275.0
5	Eastman Kodak Co.	$12.2	General Motors Corp.	$22.3	Citigroup Inc.	$256.4
6	Sears Roebuck & Co.	$11.8	Royal Dutch Pet.	$16.9	Wal-Mart Stores	$237.3
7	Texaco Inc.	$9.5	British Telecom	$16.8	Microsoft Corp.	$230.6
8	General Electric Co.	$8.5	Du Pont de Numours	$16.3	American International Group	$228.2
9	Xerox Corp.	$6.8	Toyota Motor Corp.	$16.2	Vodafone Group.	$219.7
10	Gulf Corp.	$6.7	Amoco Corp.	$16.0	Merck & Co.	$215.1
11	Du Pont de Nemours	$6.3	Bellsouth Corp.	$15.0	Nokia Corp.	$202.4
12	Ford Motor Co.	$6.1	Sears Roebuck & Co.	$14.2	Intel Corp.	$202.3
13	Royal Dutch Pet.	$6.0	Chevron Corp.	$13.0	GlaxoSmithKline	$201.9
14	Mobil Corp.	$5.8	Mobil Corp	$12.4	Oracle Corp.	$162.2
15	Minnesota Mining & Mfg Co.	$5.6	American Express	$11.8	SBC Communications Inc.	$161.6
16	Avon Products	$5.1	Procter & Gamble Co.	$11.7	BP Amoco.	$155.5
17	Coca-Cola Co.	$5.0	Standard Oil Co.	$11.7	Coca-Cola Co.	$151.1
18	Procter & Gamble Co.	$4.7	Matsushita Electric	$11.5	IBM Corp.	$150.8
19	Chevron Corp.	$4.6	Atlantic Richfield Co.	$11.5	Johnson & Johnson	$146.1
20	ITT Industries	$3.6	Eastman Kodak Co.	$11.4	EMC Corp.	$145.5

Another example is cellular phone technology, which leads Nokia Corporation, one of the world's best-known brands, to high level of market value. Presently, every third mobile phone sold in the world is a Nokia **(Kuikkaniemi, 2004)**. In other words it is possible to state that firms that have killer products usually have great market value.

5.1.3.3 Killer products redefine human interactions, habits

A killer product has potential to reshape human interactions, habits from bottom to the top. These products have a big impact on target users' life. Besides, they quickly become necessary for their users. For example "e-mail" was purposely a network of scientists' computers. Now, it has redefined human interactions, communication habits. Cellular phones, PC, television and Internet are prime examples that have worked nearly the same way. A killer product becomes central to its specific user and creates a novel category her/his life.

Wright and McCarthy (2005) argue that the implementation of technology is rebuilt by designer in terms of experience, culture. For instance; with the introduction of mp3 technology users gained the new ability "Randomness" which is not available before. The 'iPod Shuffle' cleverly integrates this new technology to re-construct user experience. "Life is random" is the design concept of 'iPod Shuffle' which has no LCD display or playlist but offers options for regular play or random order with a shuffle button.

5.1.3.4 Killer products are indispensable

A killer product offers or seems to offer pleasure, satisfaction and fulfillment to its user. It is presented as virtually indispensable or much superior to rival products; also extended use. A user, who many times non-purposefully buys the product, appears unable to avoid it later. A product has to be personalized in order to become indispensable to its user.

Because the killer products become indispensable in our life, users lacking these products are marginalized. Not many of us can imagine life without some killer products, but we also have difficulties to understand a person without a killer product. Moreover due to their unavoidable characteristic, products such as mobile phones, e-mails are assumed as a mandatory in contemporary life. Lacking these facilities and resistance to them, such as turning mobile phones off (let alone not having any) or not checking e-mails daily become unusual. Internet and mobile technologies create many opportunities, solve problems; nonetheless, their

pervasiveness and dominance dictate human interactions and attack individuality as we are constantly "on call" both at work and in our free time. As the speed of technological availability increases, the pace of human ability is expected to increase as well.

Regardless of income, every one of consumers is affected by killer products in expanding mass market. In short, in the 1990s there was no home without TV, in the 2000s; no home without Internet, now; none without a mobile phone, and no youngster without a portable music player.

5.1.3.5 Generality and generic products

The powerful impact of killer products on society leads them to be used as generic terms or to leads renaming of the objects. The sticky notes that allow removal and reattachment to paper are frequently called "Post-it". Although "Post it" is a registered trademark under the license of 3M, it used as a generic term for any such product. 3M manufactures other products towards the Post-it note concept, leveraging the success of the brand. This ubiquitous originally yellow square spread to the computer software in versions like Stickies or PtiMemo, 3M markets its own software under the name of 'Post-it software note'.

5.1.3.6 Expectation of standardization

The results of killer applications are mostly indirect and unpredictable. Becoming the standard itself is the killer product's second order effect, which is far reaching and unintended. **(Downes and Mui, 2003)**. Killer products answer the need of standardization. Consumers often prefer defined standard learning. As an example, Microsoft Office document guarantees that your document can be easily exchanged by others.

QWERTY is a good example which represents how product itself becomes the standard. Consumer's expectation, as a typing behavior, is for constitution in typing for ease of use. Time and sources available for this adaptation lead consumers unwilling to switch this standard.

Furthermore the value of the QWERTY increases when the number of people uses this keyboard increases. QWERTY keyboard supports users to adapt the keyboard in minutes almost anywhere in the world. Users are mostly expecting a standard for keyboard layout arrangement.

Adoption of a new technology might take long time and money such as investing for consumer education. Cost of the alteration stops firms switching a standard. The

tendency of the market is for standardization. Dominance of these standards can save firms, designers and consumers from odd situations.

5.2 What is Killer? -Product, Technology, Brand?

Is the technology, the product or the brand? **Bonaccorsi (2006:2)** speaks about radical products: "Significant role is played by technological evolution, but the interplay between the understanding of customer needs and the opportunities offered by technology is not subject to a thorough analysis". It is feasible to look at the subject with respect to different layers such as killer brand, killer technology or killer product. Some intersections are obvious. A possible combinations; a killer brand produces a killer product by introducing a killer technology. Nevertheless, a company might not be the pioneer of the killer technology or have the drastic innovation but still have the killer product.

Table 5.2 examines basically the killer product states. For example in the case of QWERTY the killer is neither technology nor brand; also we can not talk about a specific brand for QWERTY lay-out keyboard. Considering the Microsoft-PC-Windows case, the killer might be the brand who is aggressive and forcing its standard firmly. The iPod example, we might call the killer is the product. Apple is not the pioneer of the mp3 technology. The aggressive pattern is led by the product identity especially by the design of iPod. For instance, in digital photographing technology killer is the technology, but it is difficult to claim a specific product or brand as a killer.

Table 5.2: Killer Product, technology, brand

Product	Technology	Brand	
i-Pod	Digital Audio,Mp3	Apple	* no particular
Windows	Personal Computer	Microsoft	name
QWERTY	Typewriting	*	
*	Mobile Phone	Nokia	

Timing of entry is a critical aspect. Pioneering a technology provide many benefits for the firm and might result in having the killer product. However, introducing the disruptive innovation does not always mean first movers advantage. Success of the product design and the readiness of the market determine the level of advantage for the product dominance.

Technological innovations are significant in product cyclical change. First movers have the advantage of shaping the consumer preferences by establishing the

precedent for product design in the newly emerging market an by investing in customer education. "A radical product innovator is the firm that first commercializes a radical product innovation" **(Ettlie and Rubenstein 1987)**.

Table 5.3 represents a comparison of product categories considering who is the first mover, who is the follower, who is the winner at the end in that product category. We could see from the table, being first at that product category does not mean that you have the killer product. But many firms believed that first movers have the major advantage. According to **Wilson et al. (2006)**, who introduced the ePen states that ``just being the first with new technology is a very momentary advantage. It is finding what people want to do with it, the killer application, that's important''.

Table 5.3: First movers advantage, brand loyalty and technological leadership.

Product	First Mover	Notable Follower(s)	The Winner
8mm video camera	Kodak	Sony	Follower
Disposable diaper	Chux	Pampers Kimberly Clark	Follower
Float glass	Pilkington	Corning	First Mover
Groupware	Lotus	AT&T	First Mover
Instant camera	Poloraid	Kodak	First Mover
Microprocessors	Intel	AMD Cyrix	First Mover
Microwave	Raytheon	Samsung	Follower
Personal Computer	MITS(Altair)	Apple, IBM	Follower
PC Operating Sytem	Digital Research	Microsoft (Ms-Dos)	Follower
Spreadsheet software	VisiCalc	Microsoft (Excel)	Follower
VCR	Ampex/Sony	Matsushita	Follower
Video game console	Magnavox	Atari, Nintendo	Follower
Web Browser	NCSA Mosaic	Netscape Mozilla MS(Internet explorer) Mozilla Firefox	Followers

5.3 Types of Killer Products

Regarding killer products, an abstraction is promising regarding modes of evolution. It might be categorized as revolutionary killer products and persistent killer products. Literature review has shown product categorizations depends on innovation level, problem solving character and newness to market such as **Cagan and Vogel (2002)** defined breakthrough product categories as revolutionary and evolutionary products. "Revolutionary products establish a new market or solution within the market [...] Evolutionary products remain as new useful, usable or desirable innovations address the dynamic SET trends" **(Cagan and Vogel, 2002:51)**. In this dissertation, it has been categorized with respect to evolutionary effect on market.

5.3.1 Revolutionary killer products

Revolutionary killer products are products opening new categories. They become pervasive with respect to a technology or functionality or a user group they

introduced. They are forcing evolution in other words they are revolutionary killer products. They are more temporary, short-lived, they lose their impact in time. Ford Model T, IBM PC and Sony Walkman are not killers anymore, although they contribute to the knowledge of technology, human interactions, and culture. Revolutionary killer products are short-lived because they mainly depend on available new technology. Technological improvements, changes significantly affect the product life cycle.

5.3.1.1 Example: Ford Model T

An example to revolutionary killer product is Ford Model T (figure 5.2). Model T was produced from 1908 to 1927 and 15 million Model T automobiles were made. It is a revolutionary car regarding its contribution to mass production. It is the first car to be assembled on a moving production line with the standardized, interchangeable parts. Model T was born in Detroit. It had a massive publicity there besides, Ford had a great local dealer network to maintain pervasiveness of Model T virtually every city in North America. Henry Ford describes the car of the masses.

> "I will build a car for the great multitude. It will be large enough for the family, but small enough for the individual to run and care for. It will be constructed of the best materials, by the best men to be hired, after the simplest designs that modern engineering can devise. But it will be low in price that no man making a good salary will be unable to own one-and enjoy with his family the blessing of hours of pleasure in God's great open spaces". **(Ford, 1907; cited in Susman, 1984:136)**

Model T, as an affordable car, had targeted middle class, majority. Therefore it had a significant role in transforming American consumers to be part of mobile society, changing the habits and expectation of the consumers.

Figure 5.2: Ford Model T, 1908

Henry Ford improvements on production line builds on Henry Ford's argument which is to produce affordable cars for a mass market. One of the aim is to drop the price of the car with improvements on the production line, cost of materials and design. The price of the first Model T was $850 in 1908, the price was decreased as low as $265 in 1923 **(Wright, 1999)**. Figure 5.3 shows a portion of the production of the Model T for one day in 1913 at Ford's Highland Park Factory.
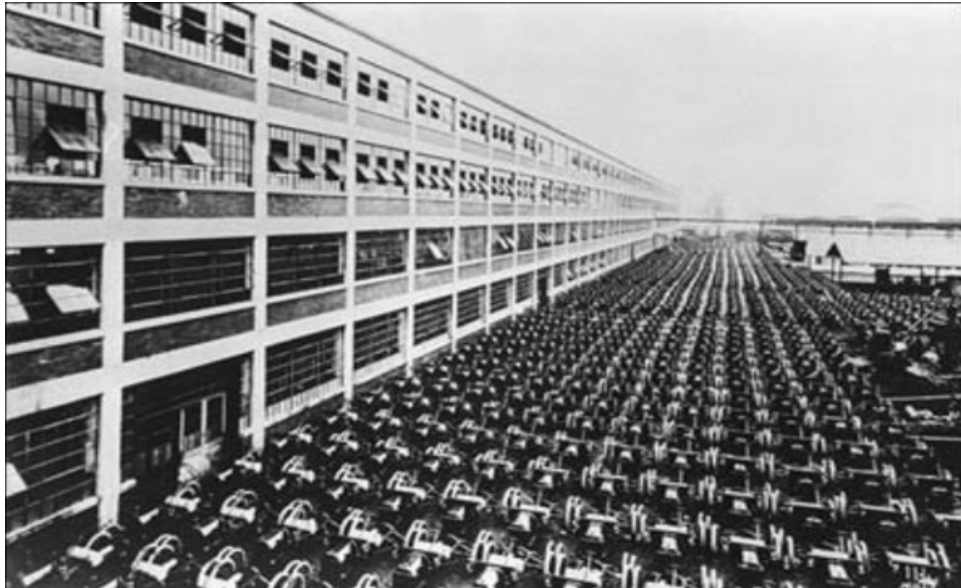
Figure 5.3: Single day production of Ford Model T **(Ulrich, 2006)**

Design of the Ford Model T had not changed much during its production years; the identity of the car in 1926 (figure 5.4) is the same as at 1908. 1926 model had such amenities as electric starter, headlights, electric ignition with generator and battery **(Wright, 1999)**.

Figure 5.4: Ford Model T-1926 **(Wright, 1999)**

Henry Ford supposedly said of the Model T, "You can buy it in any color, as long as it's black". Before 1913 the Model T was available in red, gray, green, and blue, nevertheless, the Model T production had been continued with only black for thirteen years. Then, in the last two years of its product life the Model T was available in 11 colors. Ford's design decision relative to paint colors was the response of a producer to economic factors of both supply and demand **(Ulrich, 2006)**. Another widespread answer (not sported by the fact) is the black dye was the quickest drying. We assume being the same increase the pervasive influence of a killer product. Besides, this color limitation affects the variety of design.

5.3.2 Persistent killer products

Persistent killer products are the killer products that we were using in the past, using now and probably will use in the future. These products resist to evolution. They hardly change over time even if they have some deficiencies in terms of design and usage. They are persistent killer products. QWERTY lay-out keyboard, jewel box CD case are in this group.

Although we are not happy with the design of QWERTY or Jewel box CD case, we are still using them. QWERTY keyboard lay-out is a text entering standard. Regarding persistent killer products, being desirable loose its value. Evolution generates diversity and diversity generates product variety. Persistent killer products are against the evolutionary change. Langrish considers QWERTY keyboard lay-out as evolution stuck **(Langrish, 2007)** but he also states that evolution continues with text entering with mobile phone T9.

5.3.2.1 Example: Jewel box, compact disc case

An example of persistent killer product is the compact disc case, also known as jewel box or jewel case (figure 5.5). The jewel box, as an ubiquitous and anonymous object has a universal presence. Jewel box has not changed much since it was released in 1982. It is quite the same with its dimensions, the material that is made of, the hinge mechanism and the space for the booklet **(Williams, 1992)**.

Peter Doodson, who was working on Philips Industrial Design Centre at Eindhoven in Holland, is the designer of the jewel box. His design is developed by Philips and Polygram. ``Philips and Polygram gave other producers to use on the condition that no changes were made to the original design. This single design gains global dominance'' **(Williams, 1992:40)**.
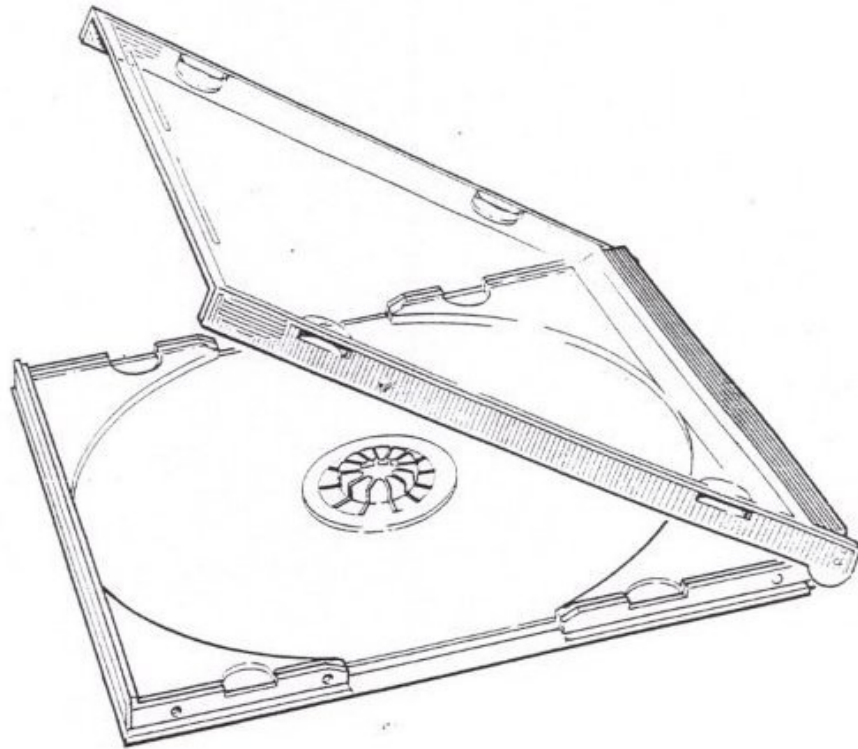
Figure 5.5: The Compact Disc Case-Jewel Case **(Williams, 1992:40)**

Design of the jewel case leads controversial issues. On the one hand, it is perceived as an object of industrial design art **(Williams, 1992)**. The design is found harmonious; elegance in proportion ``clutched in the hand like a hardback book, it transforms each compact disc into a precious object, every piece of cover art into a framed miniature. It is even called the jewel box'' **(Williams, 1992:40)**. Besides, It is considered an industrial design and a marketing success regarding its world wide distribution at that decade **(Williams, 1992)**. Jewel box is also ecologically friendly. ``The Jewel box is all plastic with shrink-wrap. Returns to labels reusable. Can contain post consumer recycled material. Can be easily recycled. Price is $.20 per container'' **(Helferich and Srofe, 1996:15)**.

On the other hand, this universal CD case has several design deficiencies for users such as the hinges are easy to break, the teeth that hold the inside of the disc is weak. The transparent front and back faces are damaged or crack when pressure is placed on them. Moreover, taking out the front booklets especially for thick and larger ones are difficult and the teeth hold them tight but are prone to failure leading to tearing. Front booklets can be easily be replaced incorrectly-the wrong way, warping or tearing the paper.

The persistent killer product has a strong relationship with the defined standards that might happen in two ways; either it works as the standard of that product category

such as QWERTY keyboard or it becomes persistent because of its strong bound to the related standard. Latter type of event is exemplified by Jewel Box. Compact Disc standard and its widespread usage have affected jewel case universality and ubiquitous status.

Certainly, there are products neither revolutionary nor persistent. Transition from revolutionary to persistent is possible since this categorization regards to modes of evolution. Furthermore, it is also possible that some revolutionary products are also persistent.

5.4 Conclusion & Discussion

This chapter has aimed to come to a definition and describe signification of killer product with its properties, effects on society. Some traits of killer product are that killer products create new product categories, killer products are successful hits in the market and make money for their owner and force other companies out of business. They are the winners or the provokers of technological battles. They redefine human interactions, habits of the users. They answer the need of expected standard. Killer product reached the consumers of mass market and become indispensable. They become integrated into the cultural fabric of society, even rename the object in their product category. Table 5.5 attempts to itemize these characteristic into themes as design, user and market. Referring to the table, colons of the table are treated separately, but a reading throughout the rows could be available for most of the rows.

Table 5.5: Properties concerning design, user, market

Design	User	Market
Successful	Desirable	Make money
Aggressive	Indispensable	Invasive
Pervasive	Pervasive	Pervasive
Dominant	Limits choice	Limits product variety
Limits product variety	Inevitable	Force rivals to disappear
Offers standardization	Answer to need of Standardization	Monopolize the market
New technologies	Redefine user expectations	Particular to market
Dominate aesthetic	Cultural fabric of society	Disorder the market
New design solutions	New function, need	Create new categories
Defines the standard	Standard wars	Imposing standard

Regarding the killer product traits, the most significant ones are being invasive and pervasive. Both of these traits should be covered by a killer product. Therefore table 5.1 draws a product comparison which will argue the definition of killer product.

Table 5.6: An analysis of killer products referring to their pervasiveness and Invasiveness status

	Pervasiveness Status	Invasiveness Status	Killer
iPod	Invasive Dominating visual aesthetic imposing own standard	Higly pervasive Best selling audio player in distory	Killer
QWERTY	Invasive Dominating type setting layout limit product variety	Higly pervsive Almost all computer	Killer
MS Windows	Limit product variety Imposing own standard	Pervasive Virtually all computers	Killer
Nokia 3310	Not invasive Do not limit product variety Do not impose its own standard	Pervasive Best sold mobile phone ever (Karljalainen , 2004)	Not Killer
Generic products	Not invasive Do not limit product variety Do not change the rules of market	Everday, routine Widespread	Not Killer
E-mail	Change the habits of user render obsolete the regular mail.	Everday use common	Killer
Playstation (SONY)	Hugely successful and competent Not invasive	Number one selling play console	Not Killer
Microwave oven	Change the habits of user, cooking tradition and complementary product. Do not render obsolete the traditional oven	Pervasive	Killer
IBM PC in 1980s	Open new categories Change the habits of user	Pervasive	Killer
SONY Walkman in 1980s	Open new categories Change the habits of user	Pervasive	Killer

If we go over the table, generic product category is an as an example to discuss the killer state. Generic products denote here as everyday objects such as the most common fork shape, the most common tea cup. These products are widespread, might be more common than a killer product not killer since they are invasive; does not limit product variety they are not killer.

For example, e-mail is received as killer product. It has changed the expectations of user. Many people has stopped using mail for communication since the electronic mailing is easy, fast and free. Mailing by pen and paper become obsolete.

Microwave oven is an example of radical product innovation. It changes the habits of consumers, affects complementary goods in the market, even it has consequences on eating technology and consumer tendencies but it does not render obsolete conventional oven **(Chandy and Tellis, 1998)**. Therefore it is not a killer product.

6 CASE STUDY: iPod

6.1 Introduction

This chapter introduces a reference to killer products innovation and design process carried out on some products investigates the role of design on killer products. The definition and properties identified on previous chapter used as a check list. iPod is questioned whether it represents the characteristic of killer product. Could we talk about the unique design contributions to killer product creation process? Is this revolutionary product result from revolutionary design process? Technological change proceeds design change. The socio-cultural effects of the iPod on consumers, society are discussed regarding design, management and marketing perspectives are also considered.

6.2 Brief history

iPod, Apple's mobile digital music player, first released in 2001, is one of the best known brand of portable media players. As of 2008, the current product line-up includes the hard drive-based iPod Classic, the touchscreen iPod Touch, the video-capable iPod Nano, the screenless iPod Shuffle and the iPhone. iPod Mini and the spin-off iPod Photo (since which is integrated into the main iPod Classic line) are not produced anymore. The current product line can be seen in the figure 6.1.

Steve Jobs claimed that **(2007; cited in Block, 2007)** ``It's the most popular music player in history. People just love it. We want to make it better, and customers have told us how we can make it better. Customers want to watch video on their Nanos on an even larger, brighter display. We'd like to put Cover Flow in, we think it's a great way to browse your music library.''

iPod Classic models store media on an internal hard drive, while all other models use flash memory to enable their smaller size (the discontinued mini used a Microdrive miniature hard drive). As with many other digital music players, iPods, excluding the iPod Touch, can also serve as external data storage devices. Storage capacity varies by model.

Capacity [1]		iPod shuffle		iPod nano		iPod classic		iPod touch
	1GB	Up to 240 songs	4GB	Up to 1,000 songs, up to 3,500 photos, up to 4 hours of video, or some of each	80GB	Up to 20,000 songs, up to 25,000 photos, up to 100 hours of video, or some of each	8GB	Up to 1,750 songs, up to 10,000 photos, up to 10 hours of video, or some of each
	2GB	Up to 500 songs	8GB	Up to 2,000 songs, up to 7,000 photos, up to 8 hours of video, or some of each	160GB	Up to 40,000 songs, up to 25,000 photos, up to 200 hours of video, or some of each	16GB	Up to 3,500 songs, up to 20,000 photos, up to 20 hours of video, or some of each
							32GB	Up to 7,000 songs, up to 25,000 photos, up to 40 hours of video, or some of each

Figure 6.1: The current line of iPod and their song capacity **(Apple inc., 2008)**

Apple's iTunes software can be used to transfer music to the devices from computers using certain versions of Apple Macintosh and Microsoft Windows operating systems. iTunes and its alternatives may also transfer photos, videos, games, contact information, e-mail settings, Web bookmarks, and calendars to iPod models supporting those features. As of September 2007, more than 150 million iPods had been sold worldwide, making it the best-selling digital audio player series in history **(Block, 2007)**.

Figure 6.2 shows sales of iPod per quarter. As can be seen, it covers the years 2002 to 2008 and shows after the iPod launched, the sales are not going well in the first two years, the sales of iPod increased drastically after 2004. The sales rose more and more steeply, throughout 1999, with a steep increase at the end of the year, and reached a peak of 22 million in first quarter of 2008. A sharp ascent has been seen at first quarter in all years, (since the most of the sales in US have been done in first quarter) then remained steady till end of fourth quarter. The figures seem to indicate iPod sales increased steadily after 2004 without a sharp fall. It might be claimed that popularity of iPod, and its impact to the consumer culture begins around 2004.

The iPod line has been upgraded many times, and each significant revision is called a ``generation''. Only the most recent (highest numbered) generation and refurbished units of previous generations of the iPod line are available from Apple for each model (Classic, Nano, Shuffle, Touch).

Each new generation usually has more features and refinements while typically being physically smaller and lighter than its predecessor and usually (but not

always) retaining the older model's price tag. Notable changes include the touch-sensitive click wheel replacing the mechanical scroll wheel, use of color displays, and flash memory replacing hard disks.
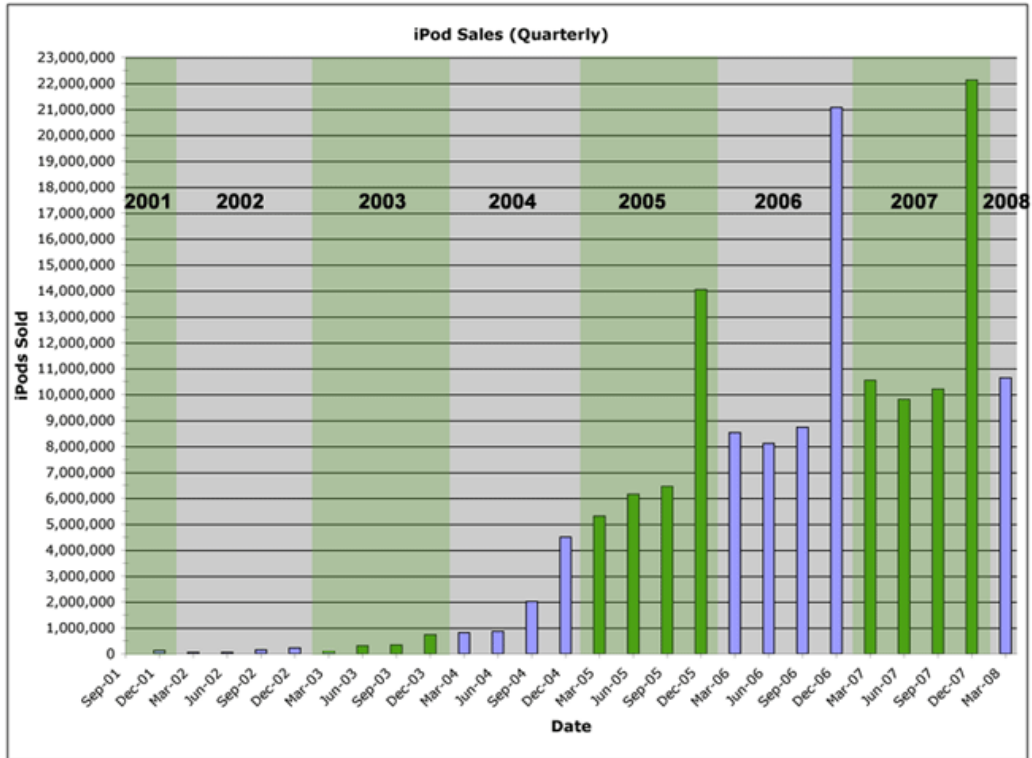

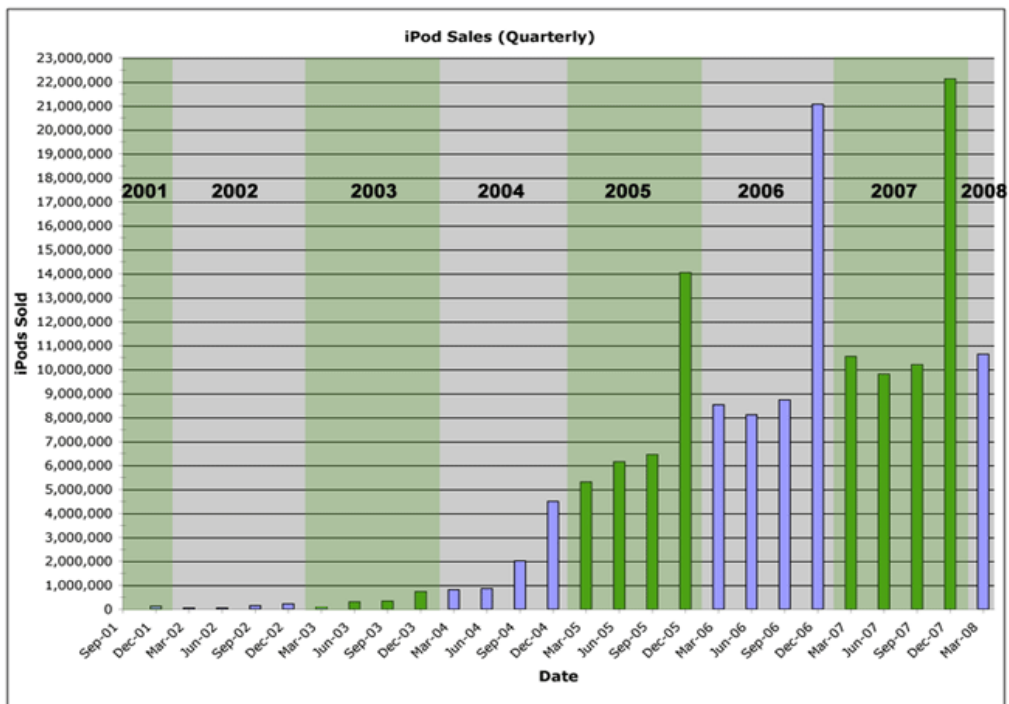**Figure 6.2:** Time line of iPod models **(Gaba, 2007)**

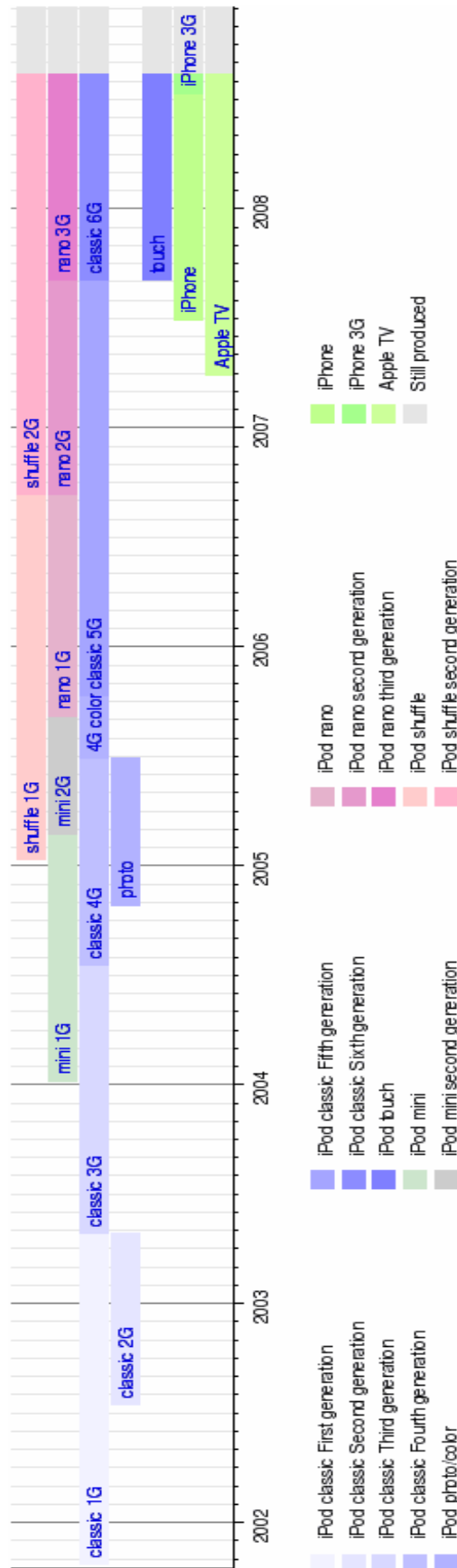**Figure 6.3:** iPod sales regarding years **(Gaba, 2008)**

Figure 6.4: iPod released dates, generation and information **(Template time line of iPod Models, 2007)**

6.3 The revolution in the music industry and personal entertainment tools

The revolution in the music industry leads us to new era where we are surrounded with audio music culture. Contemporary consumer culture is a sound-consuming. Consuming the sound through personal entertainment tools is widespread. It has started with walking with music by Sony Walkman, but it has become much more widespread and become essential part of the life drive with music, wake up music, music through out mobile phones, and sleep with music so forth. The music industry is a fast renewed area and understanding the development of music industry is important for the analysis of iPod.

Digital music distribution revolution can be argued from the history of recording industry. Until the 1940s, selling the performance records had not been employed in music industry. The Beatles were the first group to become recording rather than performing artists. Therefore, The Beatles is also known as the ``white album'' **(MacDonald 1995)**. The evolution of the music industry might be summarized as the music industry revolved from format LP vinyl albums, to cassettes than CDs and mp3 players. On the contrary, mini disc, developed by Sony, never reached the widespread adoption.

i-Tunes did it just in time, Apple opened iTunes store in 2003 and they got an agreement with the five major record companies, such as Sony, Universal, BMG, Warner Music Group and Emi, iTunes launched with an initial catalog of 200000 songs for purchase at 99 cent per song **(Amicone, 2004)**. Drastic result of iTunes music store reference to iPod sales has increased after the iTunes was opened in 2003 (figure 6.2). iPod success is due to brand significance and pleasurable design advantage but more importantly it is result from utilizing the MP3 audio format technology well by offering song purchase rather than the albums on CDs. Table 6.1 demonstrates killer product examples through the correlation between usage of dominant technology and its distribution.

Table 6.1: Comparison of killer products, in terms of song distribution format and delivering channels

Audio technology	mp3/song	CD /albums	Audio Cassettes-Album
Distribution channel	i-Tunes	Sony Music	Sony Music
Killer Product	Apple iPod	Sony Walkman	Sony Walkman

Regarding the music distribution process, Sony has supported mp3 format very lately since the main concern of the Sony (depending on Sony Music Company) was music distribution by albums. Formerly, the dominant music distribution technology

is on albums. Sony had Walkman, it was a killer product of Sony, focused to distribute music by audio tape cassettes. On the other hand, Apple has i-Tunes, as a mp3 distributing- selling- supporting device, reinforces the iPod sales in return.

Although the audio cassettes was replaced by the compact disc technology, portable CD Players have never reached pervasive state of the legendary Sony Walkman in 1980s. This might happen because of mobile CD player had a defect, which is laser beam in the CD player is sensitive to movement, leads to quality loss of music. Listening from CD denotes the quality of music experience. Consumers prefer to listen from hi-fi CD player rather than the earphones. The music experience is notably different than portable audio player. Compression of audio files is MP3 files, downloadable through Internet.

There are different formats in audio industry and there exist battles for that standard. The common standard is mp3 compression. iPod imposes its own standard by using the iTunes software. iPods converted the mp3 song data through iTunes. iTunes does not support ogg vorbis, Flac, WMA-DRM, AAC and some other formats.

6.4 Dominant characteristic of iPod design

Two simple forms signify the iPod visual identity, one is the iPod rounded rectangle (figure 6.5) and other is the iPod wheel (figure 6.6). These forms also have dominant results on the environment of iPod which includes designed objects and graphics. Not only other music players, graphics, but also user interfaces of many applications have adapted these forms. This widespread adoption supports the network of iPod.
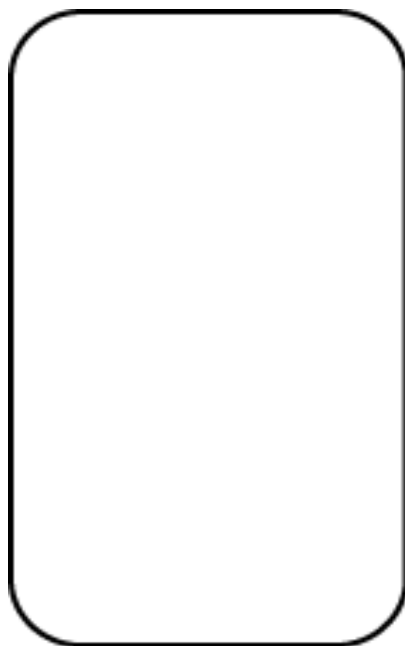
Figure 6.5: iPod rounded rectangle

Figure 6.6: iPod wheel **(Wheelwiki, 2007)**

The design patterns of iPod adopted by the many competing rivals. iPod dominates a kind of aesthetic in audio music entertainment gizmos. The figure 6.7 demonstrates Creative Zen and Creative MuVo. The design patterns of Zen 2005 and MuVo 2004 are similar. The design language of Creative could be seen clearly from these two products. However, this has changed; the styling of new generation Creative Zen has a different design identity. The Creative Zen's language of form is similar to that of the iPod. It features a clear layout and rounded-off edges, wheel that lend it a iPod like appearance.. The Creative Zen 2005 and Creative Zen 2007 (figure 6.8) do not have the same design approach. The parallel is illustrated by the figures 6.8 and 6.9. Regarding figure 6.8 and, it could be seen clearly two forms (rounded rectangle and wheel) that represent iPod identity has added the design of Creative Zen.

Figure 6.7: Creative Zen, left 2005, Creative MuVo, 2004

Figure 6.8: Creative Zen+, 2007

Figure 6.9: iPod Shuffle, 2006

Another design similarity is related to earphones that is shown in the figure 6.9 and 6.10. Comparison of the images of Zen, 2005 and Zen, 2007, and iPod Shuffle, considering earphones, presents that earphones in the first image are placed as a classical way, they are custom, random earphones. However the contrast of Zen 2007 from the 2005 is reminiscent of the earphones (also known as``earbuds'') of iPod. The white clean line, as an distinct iPod characteristic, has inspired the design of Creative Zen. It could be said that the design of the Creative Zen earphones evolved towards the earbuds of iPod. Even the graphic image is affected by the

design characteristics of the iPod. The orientation of earphones, layout of the image regarding earphones, how it is placed is not different than the iPod Shuffle model in 2006.

Similarity is not limited with the styling, it is also continued with the parallel of technical capabilities of Creative Zen 2007. Creative Zen released on 2004 uses the file transition by USB port, where as Zen released 2007 uses a small cable to transfer files like iPod.

Another example is iPod and Microsoft Zune released in 2006. Similarities and contrast of Microsoft Zune with Apple iPod can be seen in the figure 6.10, 6.11, and 6.12. The black one is Microsoft Zune and the white one is Apple iPod.

Figure 6.10: Zune vs. iPod -front view **(Ludington, 2008)**

Figure 6.11: Zune vs. iPod: thickness and height **(Ludington, 2008)**

Figure 6.12: Zune vs. iPod: socket, data transfer **(Ludington, 2006)**

The Zune and iPod are related in appearance or nature from different aspects. The language of form is similar. Structure of the Zune resembles to iPod such as data transfer socket, how it is oriented on the product. They are not identical but alike though (figure 6.12).

6.5 Complementary goods and services

Complementary goods and services are influenced by the significant success of ubiquitous iPod. As an example, Nike and iPod has designed an accessory for sportsmen. This Sport Kit is a personal sensing device, maintains a coordination between shoe and iPod Nano. The sensor uses a sensitive accelerometer to measure your activity, then wirelessly transfers this data to the receiver on your iPod Nano **(Nike+iPod, 2008)**. The details are shown by an advertorial illustration available in through web site (figure 6.13)

iPod and BMW work in a coordination and iPod user face integrated to BMW automobiles **(iPod Your BMW, 2005)**. Although this connectivity is now available for other portable media players, the campaign is still named as ``iPod your BMW" **(iPod Your BMW, 2005)**.

It is an user friendly interface for drivers to use their iPods easily and efficiently. Apple announced in 2005 that similar systems would be available for other vehicle brands, including Mercedes-Benz, Volvo, Nissan, Alfa Romeo, Ferrari, Acura, Audi, Honda, Renault and Volkswagen.

Another example is the Bank Garanti, one of the well known banks of Turkey, offers a sticker credit card, advetised it as ``compatible with iPod" **(Garanti, 2008)**.

How to Use the Nike + iPod Sport Kit

Step 1.

Place the sensor in your left Nike+ shoe, in the built-in pocket beneath the insole. You can leave the sensor in your shoe even when you're not working out.

Step 2.

Attach the receiver to your iPod nano. The receiver fits snugly into the dock connector, located on the bottom of your iPod nano next to the headphone jack.

Step 3.

Hit the ground running with workout-based voice feedback, Nike Sport Music content, and an iPod nano that stays in tune with every step.

Figure 6.13: Nike+iPod sport kit **(Nike+iPod, 2008)**

6.6 Product-user Relationship

Apple has focused its development on the iPod line's unique user interface and its ease of use, rather than on technical capability. iPod has become indispensable for its target user life. Regarding iPod success, personalization might also be achieved because of its simplicity. Wallace states that "In a society of mass customization, only the simple can become the "my" **(Wallace, 2006)**. Personalization might be a critical reason for being indispensable in user's life.

iPod users holding their iPod; whereas, other portable media player users put their audio music player on their pockets. iPod has become a fashion statement for its consumer. Apple is forcing this statement and manipulative through its advertisement and connote the message that "If you don't own an iPod you're not part of the cool crowd" **(Anything but ipod, 2008).** The figure 6.14, an iPod advertisement, demonstrates how iPod presents the iPod user and product relationship.

Figure 6.14: iPod advertisement- iPod user

Some comments of iPod users are presented below, demonstrates product attachment, mobile music culture. The materials is part of the Bull's research on iPod and culture of mobile listening. His material were obtained by ``an ongoing qualitative research project on the use of iPods internationally. The 426 respondents are mainly from the UK, USA, Switzerland and Denmark. Respondents responded to interview requests posted on a variety of Internet sites including Wired News, Macworld, BBC News Online and the Guardian Unlimited. Respondents completed

a qualitative questionnaire of 35 questions. Individual respondents were then contacted again in relation to their specific responses"**(Bull, 2005:54)**.

> "I am a huge music fan. When I was a girl, I dreamed of having my own Wurlitzer jukebox to play my music, so I could have all my favourite songs available at a moment's notice. I own over 1000 CDs, and would never be able to listen to that volume of music if it weren't for the iPod. While it took weeks to rip every CD I have to my iMac, the time was well spent. The ability to take a large chunk of my music collection with me wherever I go is amazing. I now listen to music any time I can: walking to and from work, at work, on vacation, on a train or aeroplane, even at home when I don't want to disturb my partner. I have any song I want to listen to at my fingertips at any particular moment. That amazes me. It truly is my own personal jukebox, and puts the soundtrack to my life in my pocket and at my fingertips." -Anna **(Bull, 2006:131)**.

From Anna's sentences we could guess the consumer loyalty to Apple as a brand, and consumer confidence to iPod as a product especially from this excerpt "...would never be able to listen to that volume of music if it weren't for the iPod".

> "It has dramatically changed the way I listen to music. I use my iPod every day, generally for 4-6 hours a day. I listen to it at work, at home, in my car, on the subway, etc. While I frequently carried a personal CD player before, the iPod has become a necessity. When I leave the house, I now check my pockets for four things: My wallet, my keys, my mobile phone, and my iPod. I never go out without all four on my person." -Mark **(Bull, 2006:131).**

The killer product become a necessity to its users. Mark is a 41-year-old network administrator living in the USA whose statement of checking every time his wallet, his keys, his cell phone and his iPod shows the significance of the iPod. It has became one of four essentials of Mark's daily life.

It can also be re-explained as `...my wallet, my mobile phone and my mp3 player...'. Within these four essentials, excluding iPod, they represent the function; they are generic names of those functions or needs. However, only the iPod is the name of a particular brand product.

> "I can't overestimate the importance of having all my music available all the time. It gives me an unprecedented level of emotional control over my life." -Terry **(Bull, 2006:131)**.

One of the strong point of iPod for its consumers is storing all their music together and having all of their music all the time with them. We can not underestimate mobile music culture. It could be arguable that whether we really need to carry all our music everywhere, every time. Consumers tend to carry all their music all the time to everywhere which change their interaction with space. As **Bull (2005)** states ``users become immersed in their mobile media sound bubbles, so those spaces they habitually pass through in their daily lives. The use of iPod demonstrates a clear auditory re-conceptualization of the spaces of habitation embodied in users' strategies of placing themselves 'else-where' in urban environments" **(p.353)**. Lacking of these facilities disappointed the user of iPod as Joey, a 28-year-old researcher living in New York, states:

> "If I forget my iPod, it pretty much ruins my day. I crave it – need it – in order to tune out guys 'hey baby'-ing me, other people's conversations on the bus or subway, and colleague's phone

conversations (work-related or otherwise). It also helps me feel less bored and soul-drained in malls, and less claustrophobic in crowds, which is very important to me" **(Joey; cited in Bull, 2005:353).**

iPod has become a lifestyle product especially in Turkey in short notice as mobile phones. The recent advertisement campaign of Apple, ``any mp3 player is not iPod'', is a good example that demonstrates iPod-user relationship. Some phrases are chosen from the text available in the campaign website.

"it is a matter of style

it is a matter of enjoyment

it is fun

it makes you happy

it makes your day.

it is durable

it fits your clothes

it is always with you

its contend not only music but also your history

it makes you dream of feature.

it shows the real you.

it stores your photos, videos, you can always watch

it might be pony to your hair, a necklace to your neck, ring to your finger, it adds to your charm.

In the car, in the bus, on airplane, while walking, running, jumping, biking, parachuting

it is ready to use all the time

it helps you to find peace and joy in your mind or it helps you to be extroverted

it does not discriminate race, religion, language, color, gender; it works with everyone.

you can wear suit while listening ipod, it would not look odd on you.

You can share the music through earphones and get close to your love. Your lover never leave you.

In Nike shoes other than your foot there is only room for iPod.

Like the others, you can have it as well.

But without an Apple logo, it is not an iPod.

iPod's most significant property is YOU!"

The statements such as ``It is a matter of style; its fits your clothes; it adds to your charm; it would not look strange on you''. These statements have targeted consumer expectations of style, fashion and trends. ``It is a matter of enjoyment; it is fun; it helps you to find peace and joy in your mind; it helps you to be extroverted; it is always with you; your lover never leave you; like the others, you can have it'' have targeted consumer psychological needs to be socially acceptable.

6.7 Pervasiveness of iPod in daily culture

Pervasive iPod affects the culture and society. In the following subsections some examples are given about how iPod cleverly and pervasively advertised. One can see the pervasiveness of iPod very easily, in daily life, in books and in series and so forth.

6.7.1 Movie: Firewall

In this movie the main character; father working for a bank is played by Harrison Ford. His family is kidnapped. He needs to transfer money from 1000 thousand accounts to the bad guys' account to save his family. He thinks about using iPod to achieve this task, needs his daughter's iPod.

The picture of the related scenes is, father comes to the bed where the mother is looking with big, frightened eyes, and the daughter is sleeping with listening iPod. The dialog between father and daughter:

Father: "Honey, I need to borrow your iPod"

Daughter: "Do I get it back?"

Father: "Sure, I promise"

The above dialog demonstrates the level of importance of the product and intense product attachment. The daughter, who is thinking of her iPod while being kidnapped, is pathetic. In the following scenes of the movie the father uses the girl's iPod to change accounts, saves his family.

6.7.2 Article: iPod, an emerging mobile learning tool

The work, ``iPod, uPod? An emerging mobile learning tool in nursing education and students' satisfaction'' presented on 23rd annual ascilite conference: Who's learning? Whose technology?, is an example to iPod placement as a learning tool. Mobile learning applications, such as educational podcasts -an ipod based broadcasting- are used by educators in order to facilitate and improve students' training.

It is described reasoning of using iPod for educational using ``changing the traditional landscape of learning and challenging educators to keep up with innovative technologies, effective learning designs, domains of learning, and today's learners'' **(Maag, 2006:483)**. The figure 6.15 demonstrates podcasting learning process. **Maag (2006)** describes podcasting as ``a relatively new method of

delivering educational material via a student's desktop computer or ubiquitous MP3 player" **(p484)**. Although the main purpose of the figure is to help to demonstrate the methodology of this learning process, it seems as an Apple advertisement.
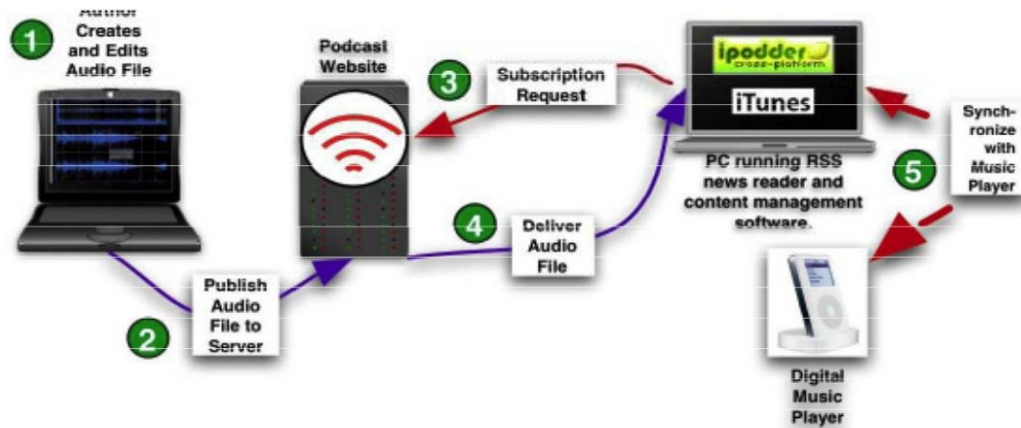
Figure 6.15: Podcasting process, used as a learning tool **(Meng, 2005 cited in Maag 2006:484)**

6.7.3 Book: Bridget Jones' Diary

The book of Fielding **(1999)** Bridget Jones Diary involves numerous statements and usages referring iPod. The book connotes meanings and important symbolic functions of iPod. Bridget's memories about the music culture in the sixties and the seventies, mostly The Beatles, the white album, are mixed with contemporary iPod stories.

> "Gah! Almost missed train. Got on in nick of time but had no choice of seat. Just one left next to quite nice looking bloke but opposite nasty looking youth in baseball cap. Said youth plugged in v. loud headphones almost immediately so had no choice but to play nice new iPod. Took this out below table with some care. Wanted nice chap to see it (advertise self as successful young professional) but not youth in cap (must not see self as very much worth mugging)" (Fielding, 1999).

Some other examples, Jones called a person as "Mr iPod" after a irritating dialog happened on the bus. The book also issued the loosing of iPod. Stolen of iPod means to loose entire music collection, iPod lost was reflected in a such personification as loosing from the "myself". **Blythe and Wright (2005:6)** argue that "the experience of the iPod is made up not just of stories about the songs creation, her (Bridget Jones) own memories and the song itself, but also of her moral and political attitudes to the technology: the experience of the iPod then, is not only social, cultural and aesthetic but also moral and political".

6.7.4 TV serial: House

The episode of medical drama, House, released 20 September 2005/Tuesday prime on Fox **(McCunications, 2005)** is an example to ubiquitous state of iPod. The main

character, Dr. House uses his iPod help diagnose heart problem of a young patient. Picture of the serial is "Dr. House and his associates gathered round a table upon which lies his trusty white iPod, hooked up to a speaker. Mr. House touches the click wheel to play the heart sounds he's recorded, and keeps replaying them until one of his associates 'hears' the problem. Then, while they hustle off to deal with the patient, House goes back to listening to classical music." "With the iPod's help, they managed to solve the episode's medical mystery!" **(McCunications, 2005).**

6.7.5 Cartoon character: Winslow

Winslow is an AnthroPC, a comic strip character drawn by Jacques (figure 6.15). AnthroPC is ``basically, a walking and talking computer with a personality'' **(Jacques, 2008)**. Winslow is an iPod like character introduced to the comic ``Questionable Content'' in 2006. **Jacques (2008)** describes Winslow as ``Apple AnthroPC model- basically an overgrown, sentient iPod. Winslow means well but is very naive and prone to corruption'' **(Jacques, 2008)**.
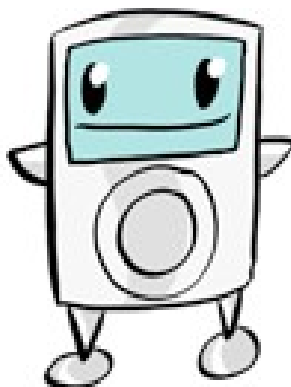
Figure 6.16: Winslow, AnthroPC **(Jacques, 2006)**

6.7.6 Magazine article:Design Intervention

Muschamp (2007) writes an article Design Intervention in the 'icon' part of the New York Times Style Magazine, speaks about the iconic position of iPod and offers a metaphorical suggestion related to Mother Ann Lee (she was a member of the Shakers, a Protestant religious denomination). "If Mother were alive, she would probably be running the design shop at Apple. Her spirit of austerity flows thorough almost every Mac and iPod there" **(Muschamp, 2007:84)**. **Muschamp (2007)** continued "in fact the most useful solution to all our design problems would be to transform Apple into a religion" **(p.84)**. Even he called CEO of the apple Steve Jobs as "Father". He is complaining about the awfulness of the hotels, public accommodation and multiplex designs. He offers that "hotel and multiplex designs

would have to be prepared under the supervision of Father Steve Jobs" **(Muschamp, 2007:84)**.

6.8 iPod Glossary

iPod, as a ubiquitous object, affects the consumer culture with made it up iPod based words as well. iPod as generic name for portable players.

Firstly, people start to use to iPod as a generic name for mp3 player. The announcement on Australian Airlines plane "Could you please turn off your iPod please?" Also in Turkey, iPod, as a name, is used for all types of portable audio players. Recently, Apple Turkey has started a new campaign; ``any mp3 player is not an iPod". The logo of the campaign (in Turkish) can be seen in the figure 6.18. The main massage of the advertisement is to identify any mp3 player is not iPod **(Mp3 çalar başka iPod başka, 2008)**.

Figure 6.17: Campaign logo **(Mp3 çalar başka iPod başka, 2008)**

``Podcasting", amateur broadcasting using iPod. iPodization as a clear and clean lines of objects **(Wallace, 2006)**

> "With the benefit of hindsight, it all seems quite obvious. MP3 players, like Apple's iPod in many pockets, audio production software cheap or free, and weblogging an established part of the Internet; all the ingredients are there for a new boom in amateur radio. But what to call it? Audioblogging? Podcasting? GuerillaMedia?" **(Hammersley, 2004)**

The term podcasting is a derivative of broadcasting and the trendy Apple Computer iPod (MP3 audio player). ``Podcast is a portmanteau word (= two words that are combined to make a new word) that was invented in 2004. It combines the words iPod, a well-known music player and broadcast" **(Oxford University Press, 2008)**. The word podcast was celebrated as the word-of-the-year in 2005 by the New

Oxford American Dictionary, because of its rise from an esoteric activity to one of great popularity. Erin McKean, editor in chief of the New Oxford American Dictionary, said: "Podcast was considered for inclusion last year, but we found that not enough people were using it, or were even familiar with the concept. This year it"s a completely different story. The word has finally caught up with the rest of the iPod phenomenon"**(Oxford University Press, 2008)**.

iPod goes beyond the name is intended, as other killer products. For example, when **Wallace (2006:21)** states, "Everywhere you look, there is another cleaner, less encumbered user interface. Call it the iPodization of our world" , he uses the term "iPodization" for something much broader than the product itself. His description is reminiscent of minimalism. Either he perceives minimalism as "iPodization" or at least he uses the name "iPodization" for a movement such as cubism, futurism.

6.9 Conclusion

In this chapter, definition and attributes of killer product has been verified by the iPod. iPod has most of the attributions of killer product.. Firstly, iPod is an widespread product especially in Europe and USA. iPod reached by far having 70% of global market.

Figure 6.18 demonstrates the network of iPod. This network illustrate the pervasiveness of iPod as well. Besides to actual product around us we also surrounded by the iPod accessories, complementary goods, iPod like portable media players. These objects and phenomenons support the network of the iPod and make it even more widespread. Besides the objects of iPod, in everyday life, we become part of that iPod network, which includes using ``iPod'' as a generic name for all portable media players, advertisements, books, TV series, internet and so forth.

Apple's successful distribution channels support its accomplishment as well. The pattern of external and internal network varies with the size of the firm and sources they have. Certainly, for a small company, reaching a network like Apple have is quite difficult.

Secondly, iPod is an invasive product, it could be seen clearly by its format dominance, rendering obsolete the old technology, monopolizing the market, imposing its own standard, limiting user choice and product variety, dominating the language of form. As a result, the iPod limits the growth in a system.
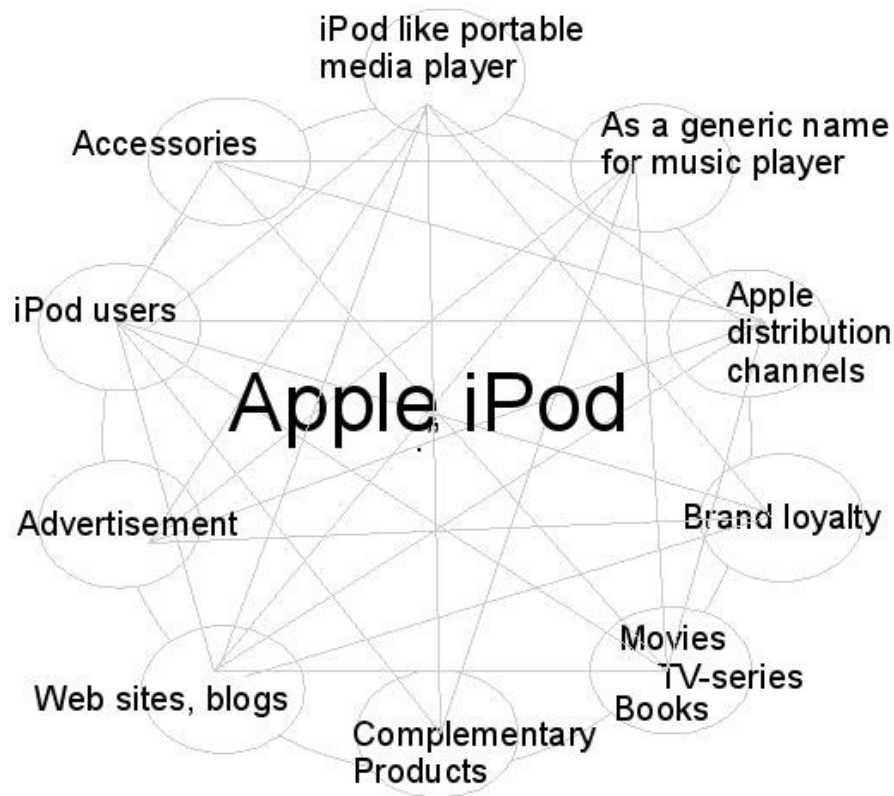
Figure 6.18: Network of iPod

Thirdly, iPod is a successful product, truly a market winner. It is indispensable for its user. It a successful industrial design product and cultural icon at the same time. The iPod branded by Apple is the first cultural consumer icon of the 21st century; it represents a perfect marriage between aesthetics and functionality, of sound and touch **(Bull, 2006:1)**.

The iPod, as a widespread invasive product affects the culture and society. It has strong relationship with its user. The iPod has changed the perception of users in public places. It demands users to think by music in everyday life, in the workplace, at home, on walk etc. ``Users tend to negate public spaces through their prioritization of their own technologically mediated private realm. iPod connotes re-inscribing of personal space through the consumption of personalized music'' **(Bull, 2005:354)**.

There are opponent reflections towards the dominance of iPod in society. The web site named anything but iPod, is a news and reviews website covers forums, news and information related to portable media players of different brands. The website excludes only iPod as a brand. The website is for who do not want to buy an iPod. Moreover, New York Times published an article *Consumed AntiPod* states the

reason of Zune users purchase the Zune because they don't want an iPod **(Walker, 2008).**

Even though killer products seem to emphasize personalization, user creativity and identity, in turn individuals become predefined typical users being a member of a target user group. Although **Wallace (2006)** introduces "iPodization" to describe simplicity and clean lines, it is possible to redefine "iPodization" as a social and cultural process that iPod build its society. It represents not only a change on how we think about personal audio-entertainment gizmos, but also a change in the way redefining individuality, social interactions with products and technology in our lives.``The increasing ability and desire of users to make the 'public' spaces of the city mimic their desire for accompanied solitude also has other potentially ambiguous results" **(Bull, 2005:353)**.

In short, iPod is an invasive product that it disorders its particular market by covering a very large state.

7. CONCLUSION AND DISCUSSION

Starting point of the research has been a weed, an aquarium ornament; *Caulerpa taxifolia*, which was a pick up from daily walking on the Caddebostan Coast of Marmara Sea, İstanbul/Turkey in 2005. It was noticed since there has been hardly any other sea plant in the sea floor. Excitement of this weed has inspired numerous research questions. The purpose of the research is to provide insight or perspective on the concept of `killer product' and also invite to generate theoretical questions on the phenomena. During the research, the main aim is to answer some these questions. The challenge is to define what killer product is and identify its properties and relation to the design.

This chapter draws a conclusion of the study also introduces the further implications of the research. The contend of this chapter as fallows; firstly a summary of the thesis is attempted, secondly the findings are discussed concerning analogical approaches in the field of design, thirdly design and killer product relation is discussed briefly and finally shortcomings of the research and opportunities for further studies is explained.

Within the general framework of study, the first two chapters has stated the subject of the study and explained the process of work; the methodology part has involved detailed descriptions about analogy and building definition in order to justify the analogy method in the dissertation.

The third chapter has aimed to build the background information of the study, in addition to systematize complex terminology related to killer product in the history. The killer product literature is littered with concepts that are inconsistently defined and conceptually confused.

Papers central to killer product are scarce, but the aggressive and the dominance patterns of technologies, products and designs in the market have been widely researched. The ideas that have been generated by **Schumpeter (1942**) on ``creative destruction'', **Abernathy and Utterback (1975**) works on understanding innovation and dominant design have been widely adopted in this study to understand killer products in a theoretical framework.

The fourth chapter has dealt with how part of the study, the analogy method is at the core of the chapter. The fifth chapter has been formed by the findings of the analysis. The killer product has been attempted to define and attributes of killer product are identified.

The six chapter is devoted to case study, iPod is examined as single case study however in the dissertation many competing technologies and examples to killer product are also discussed. QWERTY keyboard, Microsoft Windows and Nokia Cell phones are stressed, repeatedly used to illustrate the idea of killer product.

The aims of the research as stated on the first chapter are reviewed as a conclusion. In this section the first aim will be summarized to conclude. The second aim is discussed in the section 7.1 Discussion on Analogy: Metaphors and Models

1. Define what killer product is

- Clarify the definition and significance of the 'killer product' concept

- Describe what makes a product killer

- Identify properties, dimensions of the killer product

2. Aims to examine a novel idea through drawing an analogy between aspects of biology and design.

To begin with, trying to achieve clear definition of the killer product by presenting the essential nature of killer product through words and phrases has been a fundamental aim during the research. As a result, we could say that an (invasive) product that disorders its particular market by covering a very large space.

The basic features of killer product might be given as being pervasive, indispensable and aggressive. Imposing its rules in the market makes a product killer. For example, forcing incompatible standard in software market is a common way of showing this kind of aggressiveness.

Truly killer products create value for consumers, extend the category, generate higher margins, and strengthen the brand. In the process of evaluating all these traits of killer products, we stress the being invasive and pervasive. it is at the end a final out come with many components. Table 7.1 itemize these traits with respect to necessity in order to be killer. Regarding the table, a killer product must be invasive and pervasive in order to be killer. Secondary and tertiary properties are owned by the most of the killer products but hierarchically these characteristic are not essential.

Table 7.1: Hierarchy of killer products attributes

Essential Properties	Pervasive
	Invasive
Secondary Properties	Limit product variety
	Create new categories
	Dominant
	Make money
Tertiary Properties	Particular to market
	Generic name of that product category
	Accidental

For example Nokia products are quite successful and extremely pervasive but not aggressive or forceful to its rivals like Microsoft, QWERTY keyboard or iPod. As a result, personalization of the gismo is not same level as iPod. Nokia has not taken side for format wars as Apple and Microsoft yet. Nonetheless, the situation might be changeable considering the market dynamics. The evolution of the telecommunication market might change Nokia. They might go for harsh product and one of their products might turn to be killer eventually. If Nokia were more aggressive other cell phones brands, rival brands would not have grown in the market. The possibility of imposing Nokia's own standards might change the environment of mobile phone market in terms technological dominance and standard wars.

Killer products might change the market rules entirely by introducing something entirely new. However, killer products might loose their killer characteristic in time after they lost their unique characteristic; what makes them different from the other products in the market. Sources of killer product are not certain but competition employs major source in developing killer products. Competition generates killer product and killer product drives competition.

Killer products have major advantages for the market. The tendency of the environment is for technological dominance that could save companies and designers from odd situations. Killer products reduce some of the transaction costs (money and time) for buyers and sellers including search costs, information costs and decision costs since the diversity is costly and suboptimal for companies.

The degree of predictability is considered, related with accidentalness, it was hard to predict that *Caulerpa taxifolia* becomes so pervasive in the Mediterranean which was formerly only an aquarium ornament, although life cycle of an alga is

predictable. Evolution is unpredictable so as market evolution and its dynamics. ``Before 1980, IBM, the world largest computer producer, had not been interested in developing a personal computer. IBM managers could not imagine personal computer market ever amounting to more than a small niche of hobbyist'' **(Schilling, 2008)**. Killer products are most of the time unpredictable, but after the dominant design is selected, strong brands, first movers, smart designers have strong advantage for introducing and establishing the killer product.

The weed is often an undesirable plant, it has harmful effects to ecosystem; however, whether a killer product is a designer's dream or fear is unclear. In a sense, killer products are like beautiful monsters. *Caulerpa taxifolia* offers a great opportunity to understand killer products, with regards to the parallel between aspects of marketplace and ecosystem. Companies are well positioned to eliminate their rivals through discovering killer products produced by radical innovation. Many other firms are trying to predict and act accordingly to the next killer product in the market. However, because of the uncertainties and risks associated with killer products, it is difficult to create, select and introduce such products. Uncertainty of customer requirements and design it is difficult to predict killer product. There is no pattern to the nature of successive innovations in a particular sector, or in the speed at which they follow each other **(Geroski, 2003)**.

Another issue is the product life cycle; mostly every product has a life-cycle, and metaphorically will be death one day. Nevertheless being dead is something different than being killed. There are lots of products we are not using any more; products could not survive in the market space **(Dead Media Project, 2008)**. It might happen because of not changing, resisting to be rebuild. **Dawkins (1987)** defined death of spices as not being able to resist to the environment they are surrounded. However, in this study, being swept away by a particular product, technology or brand has been concerned.

7.1 Discussion on Analogy: Metaphors and Models

Examining a novel idea through drawing an analogy between aspects of biology and design is an aim of the research and will be discussed through the section. Building an analogy is a useful method for exploring situations in which the subject area is not well understood. Cases of comparison are defined as abstractions of events that are limited in time and space. It is argued that estimation by analogy offers some distinct advantages. Analogy is able to deal with poorly understood domains since solutions are based upon what has actually happened as opposed to chains of rules

in the case of rule based systems. "Users may be more willing to accept solutions from analogy based systems since they are derived from a form of reasoning more akin to human problem solving, as opposed to the somewhat arcane chains of rules or neural nets" **(Shepperd and Schofield, 1997:738)**.

Analogy also presents how we approach the phenomena. "As our choice of metaphor will reflect our conceptualization of the phenomena, our metaphorical choice may change depending on the context of the problem" **(Lakoff and Johnson, 1980)**. Although *Caulerpa taxifolia*, as a weed, has a significant role in this process, there might be other aggressive species, other than *Caulerpa taxifolia*, can be helpful to improve killer product idea which will be studied further since " each metaphor defines only certain aspects of an abstract concept" **(Lakoff and Johanson1980:198)**.

Whether biological analogies are acceptable is a discussion point in this thesis. Biological analogies are widespread, used in understanding economy, finding new ideas for design, and exploring new ideas. However we might argue that it cannot stand alone. It is the very first step towards a treatment of the foundational problems. The understanding of the role and the limitations of biological analogies is critical.

In this thesis we employ different analogies. These are between product and species; product life cycle and living phases; market place and ecosystem; technological change and evolution. Comparison of these source and target domains provides foundations for discovering dimensions and properties of the killer product. The success of the analogical reasoning is depend on the degree of structural consistency of two domains **(Yanowitz, 2001)**.

Drawing an analogy is quite appealing between killer product and the killer weed; *Caulerpa taxifolia* has lots of potentials to figure killer products out. However it is limited in the period of research. This analogy is used to reach a pattern for understanding killer products. After the killer product has been defined and characteristics have been identified, the comparison has started to loose its significance.

One shortcoming is that working on similarities has been quite motivating, the parallel has given excitement, inspiration has forced to ask questions; however, looking for differences is rather featureless since the differences are more obvious.

In short, it is well said by **Marshall (1898:39)** ``analogies may help one into the saddle, but are encumbrances on a long journey. It is well to know when to introduce them, it is even better to know when to stop them off''.

7.2 Design and Killer Products

Regardless of the novelty of design, the content of the design, the content of designing more or less the same, involving different human activities and capabilities. Design is one of the strongest tools that makes ever improving manufacturing infrastructure in a country, produce more added value. Design is our best tool to intervene market forces. Design can open new paths to create new brands, can create new markets by responding to a new demand and consequently can strengthen the production capacity.

In this thesis we have assumed that designer's role in creating a killer product is the interpretation of new technology, its application in the development of new products; identifying opportunities for radical innovation for its particular sector via understanding the user's broader needs and expectations. ``Design needs growing understanding for user experience and emotions surround this experience'' **(Cagan and Vogel, 2002)**. The process of creating a killer product calls for realizing social change and trends, user needs, and the product attachment. Economic trends, market dynamics and technology should be included as well.

Killer products are indispensable products for their users. Product-user relationship is strong, sometimes this relationship is passionate and sometimes inevitable and obligatory. The role of design is noticeable in the process of this strong relationship built between the user and killer product. Otherwise, the role of design is limited, mostly brand or marketing issues gain importance; however, there are products like iPod, the role design is significant in many aspects, in the process of product development.

The iPod gets benefit from audio music revolution with song distribution. These revolutions are carefully turned to advantages by the role of product design. Apple reached the global success and killer product by the iPod line's unique, revolutionary user interface and its ease of use, rather than on technical capability.

Designing a pervasive product to its passionate user needs crucial design criterion like providing user-centered functionality, integrating insight with advanced technology and implementing the details well. Enriching the experience of fullness in ones mind with forms and functionality is the designer touch to the product.

Integrating product and brand experience is employed for achieving emotional domain in the design field. Brand activation is supported by killer product or product activation is maintained by killer brand. The distance between business strategy and design strategy limits the role of design in creating killer products.

Technological revolutions and opportunities are potential for killer product development. These revolutions are often new to consumer and demand customer learning. The role of product design become significant in ease of this consumer learning an adaptation. For example, Nokia success's depends on revolution in the telecommunication industry in 1990s. Nokia has highly successful interface for users leading worldwide success. Transition to mobile technology in 90s, adaption is significantly important for consumers. Nokia has handled this adaption with its user friendly interface.

According to **Baxter (1995; cited in Junior and Guanabara, 2005:149)** ``the most important, and probably the most obvious factor is that a product should strongly distinguish itself from its competitors' and present characteristics that consumers appreciate. Within this context, it is the designer's duty to incorporate new alternatives in his/her project and to explore new procedures that will allow innovations, with the aim of meeting market expectations and client requirements. The interaction between the designer and the client's strategies should always be in focus''.

Opponents and supporters of the killer product exist in the design field. The impact of killer products might be harmful to the design process. They have guiding influence on the marketplace therefore it becomes difficult to design new products. After the dominant design is approved; firms, industrial components of the market, designers, manufacturing chains, delivering capabilities reinforce this dominant design. By doing so, the variety of technology, design options are not supported. They limit the product range and variety of design. Variety is a critique for design and mass consumers. Variety needs to competition and competition needs Darwinian change **(Langrish, 2007)**.

Besides, killer products dominate a kind of aesthetic, and the new products mimic killer products (an example of this was when Apple first introduced the i-mac with a brightly-colored, translucent plastic case soon lots of other products, not just computers, started to adopt the same aesthetic). Unfortunately, users sometimes unintentionally make inappropriate purchase decision since killer products limit the choices.

Widening the design variety regarding functionality, personalization is central for design process. Variety in innovative performance is constraint by killer products. Strategic, cognitive and organizational aspects of the firm to be taken into account by the policy market.

The killer product's second order effect is wide and much more long run than it is expected. The concept of killer product influences the variety in terms of design, technology and services. Their far reaching, aggressive, harsh effect might result in extinction of products. Killer product leads to extinction to many product categories.

Killer products have a common trait which is preserving a consistency in the product line. This consistency might result from the design identity or user interface or even the product itself. For instance, iPod's language of form does not change much, or QWERTY and Jewel box CD case, both do not change much as a product itself with its facilities and technology. Ford Model T, within its 13 year production, it has minor design change apart from improvements in technical capabilities. Henry Ford's well known quotation "The customer can have any color he wants so long as it's black" it is a kind of imposing a standard. Ford Model T is pervasive and appealing to majority at that time.

7.3 Shortcomings and Opportunities for Further Research

The obvious shortcoming of the thesis is the information related to case study examples is not first hand. This shortcoming will be remedied with further studies which will include interviews with the design team and questionnaires with killer product consumers. Second shortcoming is difficult to discuss killer product definition, as a stipulative definition, since there are no existing standards against to compare.

This research has potential for further research since the thesis is just a beginning for understanding the concept of killer product. To stimulate further progress in empirical research on killer product designs, we advocate a standardization of terminology. Conceptualizing killer products; as ideas, artifacts, products, designs and services that evolve in market ecosystem. This complex perspective provides both unambiguous definitions for killer products and lead to missing the defining points. Considering the subject, there are numerous questions have researched yet. Multiple levels of analysis (system, subsystems and components) of killer products are not included in the research but will be studied further.

Killer products influence human relations, communication habits and expectations. Arguably, their dominant characteristic and pervasiveness have a harmful, suffocating effect on us as individuals (choice, identity, freedom) and on society. Detailed user research is not included in this research; more detailed human interactions with killer products might be discussed on further studies.

Killer products are important in understanding the evolution in the field of design. Killer products has potential to create new product categories in industry while render the others obsolete by being pervasive and invasive. Killer products are significant in understanding the market ecosystem. Finally, this novel subject is important for the design theory.

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