

UNIVERSITY OF LJUBLJANA
FACULTY OF ECONOMICS

MASTER'S THESIS

**THE CLASSIFICATION OF INNOVATIONS: THE CASE OF
APPLE INC.**

DECLARATION OF AUTHORSHIP

I, the undersigned GOSNAR ANA, student of the Faculty of Economics, University of Ljubljana, declare that I am the author of the thesis entitled 'THE CLASSIFICATION OF INNOVATIONS: THE CASE OF APPLE INC', which was prepared in cooperation with the mentor assist. Dr. PETER TRKMAN.

I expressly declare that this work was written in accordance with the provisions of the Copyright and Related Rights (Official Gazette. RS. 21/1995, as amended) and authorize the publication of this thesis to the faculty website.

With this signature I assure that:

- the proposed wording is the result of my own research work;
- the language is presented accurately and technically prepared in accordance with the instructions for producing the works of Economics University of Ljubljana, which means that I
 - took care of the works and opinions of my mentor and indicated in accordance with the Instructions for producing the order of Faculty of Economics, University of Ljubljana;
 - obtained all the licenses to use copyright works, which are used in the text, and I've made clear in the text written;
 - understand that plagiarism - the presentation of foreign (in written or graphic form) as my own - is punishable under the Law on Copyright and Related Rights (Official Gazette. RS. 21/1995, as amended);
 - am aware of the consequences that would be based on the submitted that may constitute evidence of plagiarism to my status at the University of Ljubljana, in accordance with relevant regulations.

In Ljubljana, May 15 2012

Signature:

TABLE OF CONTENTS

INTRODUCTION1

1THEORETICAL FRAMEWORK FOR THE CASE STUDY3

1.1 Innovation	3
1.2 Types of Innovation according to the OECD.....	5
1.2.1 Product.....	5
1.2.2 Process	6
1.2.3 Marketing	8
1.2.4 Organization	9
1.3 Other classifications of innovations	10
1.3.1 Radical versus Incremental Innovation	11
1.3.2 Disruptive versus Sustainable Innovation	12
1.4 Models of Innovation.....	14
1.4.1 Linear Models of Innovation	14
1.4.2 Interactive Models of Innovation	15
1.4.3 System Models of Innovation.....	16
1.4.4 Open and Closed Models of Innovation	18
1.5 Innovation Strategies.....	20
1.6 Company Innovation Rankings.....	22

2REDIFINING INNOVATION: A CASE STUDY OF APPLE INC24

2.1 Methodology.....	24
2.1.1 The method used to differentiate the types and classifications of innovations	25
2.2 Company History.....	28
2.2.1 Computer Hardware	30
2.2.2 Devices	34
2.2.3 Software.....	38
2.3 Innovation Environment at Apple Inc.....	40
2.4 Models of Innovation at Apple Inc.....	42

3INNOVATION CLASSIFICATION OF APPLE PRODUCTS43

3.1 Quadrant 1: Radical Disruptive Innovation	44
3.2 Quadrant 2: Incremental Disruptive Innovation	45
3.3 Quadrant 3: Radical Sustainable Innovation	46
3.4 Quadrant 4: Incremental Sustainable Innovation.....	49
3.5 Findings	50

CONCLUSSION52

REFERENCE LIST54

LIST OF TABLES

Table 1: Radical vs. Incremental Innovation	12
Table 2: Disruptive vs. Sustainable Innovation	13
Table 3: Closed versus Open Innovation Principles	20
Table 4: The 10 Most Innovative Companies	22
Table 5: Technology Review TR 50 2011 (in alphabetical order).....	23
Table 6: Current Product Line (Mac).....	34
Table 7: Current Product Line (non-computer).....	38
Table 8: Current Product Line (Software).....	39

LIST OF FIGURES

Figure 1: Types of Innovation according to the Organisation for Economic Co-operation and Development.....	5
Figure 2: Technology Push Model of Innovation	14
Figure 3: Market Pull Model of Innovation	15
Figure 4: Interactive Model of innovation	16
Figure 5: Systems Model of Innovation.....	17
Figure 6: Closed Model of Innovation	18
Figure 7: Open Model of Innovation.....	19
Figure 8: Degree of Improvement versus Magnitude of Impact.....	26

INTRODUCTION

Innovation is crucial to a company's survival. Innovation itself is a very extensive concept that can be comprehended in a variety of different ways. Various scholars have defined innovation to different magnitudes relating to their research industries, businesses or subjects. Innovation has also become a central notion in the media and is a part of everybody's vocabulary. Concisely stated, innovation has become the motif of modern society; a solution for resolving many problems, and the phenomenon to be studied. The problem with defining and understanding innovation is that it is not an easy concept to grasp, as there are many changing variables and surroundings that affect it. It seems like a concept where authors have an intuitive sense of what innovation is, but have a hard time formalizing a conclusive definition.

The Online Etymology Dictionary states that the word innovation originated from the Latin *innovatio* dating back to 1540 and stemming from the Latin *innovatus* of *innovare* "to renew or change," from *in-* "into" + *novus* "new" (Online Etymology Dictionary, 2011). Rainey (2005, p. 1) believes that innovation is represented by changes and improvements, which represent a sudden change in a product, technology, service or processes. Furthermore it is evident that innovation is today viewed as disruption, all the time, which consequently has the effect of disregarding other forms of innovation, which will be shown in this thesis (Briggs, 2012).

The main problem with researching innovations and their different types is that there are many different authors and studies, dividing innovations in respect to different areas so that one gets confused when trying to classify them. There is also the problem of not really having a complete explanation of the relations between the different innovations. Furthermore there is no widely acclaimed theory about classifications; everyone has his or her own take on it. This is when questions as the following surface. If an innovation is sustainable, can it also be radical and at the same time have an incremental aspect to it? Another side of the problem is on the business side of things, as companies do not know what kind of innovations are best for them, even more they can not reliably say that one innovation in the past was radical, while another was disruptive. The lines between the terms in theory are blurred, even more in practice.

The purpose of this thesis is to gain a better understanding of the term and classification of innovation in connection with one of today's most widely acclaimed innovative companies, Apple Inc.

The goal of this thesis is to discuss the innovations at Apple Inc. and how their innovations influence their industry. Consequently the goal is also to understand what kinds of innovations are found in Apple Inc. according to pre-defined innovation classifications. Furthermore this will show if the theoretical classifications of innovations are useful to classify the innovations in practice and how the theory behind innovation can be adjusted to be more in accordance with practice.

The research questions for this thesis will be based on the discussion above and focus on the following issues:

- How the models of innovation at Apple Inc. have been changing during its history,
- Which types and classifications of innovations does Apple Inc. frequently use for their products,
- If and how innovations at Apple Inc. can be easily divided into types and classifications,
- Are there any connections between the types in different classifications of innovations.

Several reasons led to the selection of Apple Inc. as the company the case study will be focused on. A major reason Apple Inc. was chosen is because it is seen as one of the most innovative companies in the world. Two parallel studies conducted on a yearly basis by Forbes.com and BusinessWeek, concluded that Apple Inc. was the top innovative company in the world in 2011. Apple has held the top spot in the Boston Consulting Group **The Most Innovative Companies** survey since 2005. Secondly Apple's products have been widely recognized as being innovative and sometimes disruptive to distinctive industries they are present in.

The first part of the thesis will examine the theory behind innovation from different authors and areas of expertise. Firstly a study of innovation itself will be presented including the beginnings of the definition until today including some of the most recognized authors in the field. Furthermore we will look at the known types, classifications, models and strategies of innovations and present them in a logical order. Concluding with a section on company innovation rankings from most recognized studies with the aim to better identify why the selected company is the top in the rankings.

The second part of the thesis will be based on the case study of an international innovative IT company. First the methodology used in the thesis will be presented including the exact method used to classify innovations into quadrants. Secondly a history of the company itself including its corporate structure and products will be presented. Finally the second chapter will end by presenting the innovation environment and models of innovation at the company in order to understand the company as a whole.

The third chapter will include the analysis stage of this thesis, including the four quadrants and the different products that can be viewed in each one. An explanation of why will be featured alongside each product. The chapter will conclude with the findings that can be made from the analysis stage. The final part of this thesis will include the conclusion featuring all the findings and connecting them to the theory.

1 THEORETICAL FRAMEWORK FOR THE CASE STUDY

1.1 Innovation

Innovation itself is a very extensive concept that can be comprehended in a variety of different ways. Various scholars have defined innovation to different extents relating to their research industries or subjects.

As expressed by the Organization for Economic Co-operation and Development and Eurostat (2005, p. 30) Schumpeter was one of the first authors that influenced today's theories of innovation. Additionally he was among the first economists to emphasize the importance of new products as incentives for economic growth (Trott, 2005, p. 7). In 1950 Schumpeter defined innovation as a means to incorporate the creation of a new good or new quality of good; the creation of a new method of production; the capture of a new source of supply; a new organization of industry; and the opening of a new market. The author also characterized the technological change process incorporating three stages (Stoneman, 2010, p. 2):

1. Invention
2. Innovation, and
3. Imitation.

Another well-acknowledged definition of innovation is given by Myers and Marquis (1969, p. 7). They believed that it was vital, that innovation was not seen as a single act, but rather "a total process of interrelated sub processes." They believed that innovation is not just the formation of a new idea, the invention of a new device, or the development of a new market, but the process of all these things combined, acting in an integrated manner (Myers & Marquis, 1969, p. 7-10).

The definition made by Trott (2005, p. 13) is even more detailed, describing innovation as "the management of all activities involved in the process of idea generation, technology development, manufacturing and marketing of a new product or manufacturing process or equipment."

Utterback and Abernathy have also played a large role in the theory of innovation. In the 1970's they argued that innovation follows a cycle. This cycle initially concentrates on product innovation pending an established design, after which it is based on process innovation (Trott, 2005, p. 397).

Rogers (1995, p. 11-12) explanation of innovation was the next step. He connected innovation with consumers, as he concentrated on the theory surrounding the adoption of innovations among individuals and organizations. He consequently wrote that innovation was "an idea, practice, or object that is perceived as new by an individual or other unit of adoption" (Rogers, 1995, p. 12). To shorten if the idea is new to the individual, it is an innovation.

Drucker (1998, p. 49-57) built on the above definitions and joined the concepts of innovation and entrepreneurship. He stated that innovation is a “specific function of entrepreneurship, whether in an existing business, a public service institution, or a new venture started by a lone individual in the family kitchen.” Additionally implying that innovation is “the means by which the entrepreneur either creates new wealth-producing resources or endows existing resources with enhanced potential for creating wealth.”

Leonard and Swap (1999, p. 8) released a study on innovation in connection with creativity, where they defined innovation is the end result of a creative activity. From this they believe that the final product is innovation and represents “embodiment, combination, and/or synthesis of knowledge in novel, relevant, valued new products, processes, or services.”

Rainey (2005, p. 1) builds on Rogers, Utterback’s and Abernathy’s definitions, deeming innovation comprises of “changes and improvements to technologies, products, processes, and services” that consequently result in advanced contributions for consumers. He furthermore states that innovation “is a creative new solution to the prevailing conditions and trends, and fulfils the expressed and latent needs and wants of customers and stakeholders”. Additionally he believes that innovation is “pivotal for sustaining the prosperity of most organizations”. If cash flow is the life-blood of a business enterprise, then innovation is the prescription for reinvigorating the organization to compete more successfully in a demanding world.

The Oslo Manual (2005, p. 46), which was developed jointly by Eurostat and the Organization for Economic Co-operation and Development defines innovation as "the implementation of a new or significantly improved product or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations."

Another view of innovation is given by Andrew, Derocco and Taylor (2009, p. 8). They believe innovation cannot be viewed as only new product development. They concentrate on things happening upstream and downstream for other applications of innovation such as the business model, enterprise structure, value chain, proprietary processes, channels, services, brands, and lastly customer experiences.

The European Union defines innovation as the “implementation of a new or significantly improved product, or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relation.” They also give guidelines for the minimum requirement for an innovation, which is a product, process, marketing method or organizational method, which has to be new to the firm.

The Commission of European Communities (2006, p. 6) furthermore believes that innovation requires a supervisory environment that is predictable, accommodates and even encourages new developments in goods and services, protects intellectual property and provides open, interoperable standards.

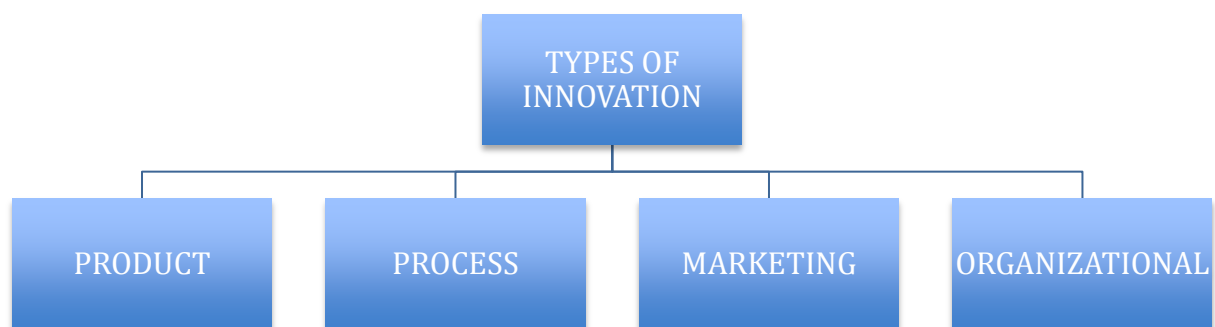
As can be seen, different scholars and organizations have described innovation diversely, focusing on different research industries and subjects. The one thing that authors agree on is that innovation features a new creation that has new distinct qualities that differentiates it from others known before. The above definitions however show the width of the study of innovation, as some authors concentrate on the business, social, financial, creative or entrepreneurial aspects of it. This is also why the definition of innovation has become very difficult to condense as it has extensive effects on its surroundings and is affected by different circumstances.

For the purpose of this thesis I will use the Organization for Economic Co-operation and Development definition of innovation; I therefore believe that innovation represents the presentation of a considerably new or drastically improved product, process, marketing method, or organizational method in relation to similar matters in the market.

1.2 Types of Innovation according to the OECD

There are many different ways to categorize innovations; each author that has been studied has a different interpretation on the kinds of innovation that exist (Don't laugh at gilded butterflies, 2004). Presented below are the types of innovations according to the Organization for Economic Co-operation and Development (2005, p. 48), which distinguishes between 4 types of innovations as is seen in Figure 1. This chapter will therefore be focused on Product, Process, Marketing and Organizational innovation.

Figure 1: Types of Innovation according to the Organisation for Economic Co-operation and Development



Source: Organization for Economic Co-operation and Development, Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data, 2005, p. 48

1.2.1 Product

The Organization for Economic Co-operation and Development (2005, p. 48) defines product innovation as the “introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses.” The report goes on to specify, that product innovations incorporate substantial enhancements in “technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics.”

Utterback and Abernathy (1978) define product innovation as “a new technology or combination of technologies introduced commercially to meet a user or a market need.”

Rainey (2005, p. 1-2) believes that product innovations basic objective is improving the strategic position and product delivery capabilities of an organization through creativity and leadership. On a larger scale the author even suggests that product innovation is a means of handling the fate of the business instead of reacting to the pressures of the markets and business environment.

Rainey (2005, p. 2) considers that product innovation includes:

- examining the needs for new products, processes, and services;
- determining the proper direction and fit for new products;
- establishing the appropriate game plan of the entire management system for developing and commercializing new products;
- selecting new-product opportunities for investment;
- enhancing the organizational capabilities to create successful new products; and
- creating the new product and executing the new-product development program.

Moore (2005, p. 65) defines product innovation as focusing on existing markets for existing products, differentiating through features and functions that current offers do not have. He writes that this form of innovation is normally highly dependent on fast time to market, although patents can sometime keep competitors at bay for prolonged periods.

Ulwick (2005, p. 2) depicts that in order for a product innovation to succeed companies must discover which customer needs are being underserved and from there devise and provide creative features in their products and services that do a better job of addressing those needs. He goes even further by explaining that satisfying one need may result in incremental improvement whereas a product that satisfies many underserved needs is likely to produce a breakthrough improvement.

For the needs of this thesis, product innovation is defined as the development of new products including changes in design and the use of new materials in the manufacture of established products. Furthermore product innovation is anything that is new to the business and its product range, even if similar products are already available and even if the product has changed only incrementally.

1.2.2 Process

According to Davenport (1992, p. 1) process innovation links the implementation of a business process with an application of innovation to key processes. A business process can be defined as “a complete, dynamically coordinated set of activities or logically related tasks that must be performed to deliver value to customers or to fulfil other strategic goals” (Trkman, 2010).

Process innovations have an internal focus and aim to increase efficiency and effectiveness of the internal organizational processes to facilitate the production and delivery of goods or services to the customers (Utterback & Abernathy, 1978).

The Organization for Economic Co-operation and Development (2005, p. 49) defines process innovation as the “implementation of a new or significantly improved production or delivery method.” They go on to specify, that process innovation includes:

- significant changes in techniques, equipment and/or software;
- new or significantly improved methods for the creation and provision of services;
- significant changes in the equipment and software used in services-oriented firms;
- significant changes in the procedures or techniques that are employed to deliver services.
- new or significantly improved techniques, equipment and software in ancillary support activities;
- implementation of new or significantly improved information and communication technology (ICT) if it is intended to improve the efficiency and/or quality of an ancillary support activity.

Moore (2005, p. 69) believes that process innovation is an approach by which firms improve profit margins by extracting waste not from the product itself but from the supporting processes that produce it. The goal is to remove non value-adding steps from the workflow.

Daft (1978, p. 195) divides process innovations into two categories:

- technological, and
- administrative.

Technological process innovations occur when new elements are introduced into an organization’s production system or service operation for producing its products or rendering its services to the clients (Utterback & Abernathy, 1978). Technological process innovations, therefore, modify the organization’s operating processes and systems (Hage & Meeus, 2006, p. 23).

Administrative process innovations represent new approaches and practices to encourage and reward employees, devise strategy and structure of tasks and units, and modify the organization’s management processes (Daft, 1978). They affect changes in the organization’s structure and processes, administrative systems, knowledge used in performing the work of management, and managerial skills that enable an organization to function and succeed by using its resources effectively (Damanpour, Walker & Acellaneda, 2009, p. 654-655).

To condense, process innovations are viewed as the introduction of a new or significantly improved production or delivery method. They can be intended to decrease unit costs of production or delivery, increase quality, produce and deliver new or considerably enriched

products. It is furthermore important to point out that there is, at both firm and industry levels, a link between process and product innovations, as radical product innovators are likely to also be radical process innovators (Reichstein & Salter, 2006).

For the purpose of this thesis, process innovation will be defined as the implementation of an enhanced production or resource method. An example of process innovation is when a company invests in a new factory and machinery and gains in terms of productivity, quality or reliability.

1.2.3 Marketing

One of the earliest references to marketing innovation belongs to Levitt (1962, p. 102). He tried to analyse the perception of “growth and profit through planned marketing innovation.” According to Levitt, marketing innovation is a neglected, since most marketing innovations were characterized as accidental and originated from outside the central cores of the industries in which they have ultimately developed. He argued that even product innovations demanded a creative thought and imagination about new marketing methods.

An additional marketing innovation definition, while concentrating on consumers, is given by Moore (2004, p. 88-90), who believes that marketing innovation focuses on distinguishing the interactive with a potential consumer during the purchase process and furthermore enriches the customer touching processes either in marketing communications or in consumer transactions.

Chen (2006) studied marketing innovation and more specifically its value considering marketing innovation as the development of new marketing tools and methods focusing on two forms of marketing innovation: one that allows firm to acquire consumer information and another that reduces consumer transaction costs.

The Organization for Economic Co-operation and Development (2005, p. 48) gives the most recognized definition of marketing innovation. It defines marketing innovation as the “implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing”. New marketing methods can be implemented for both new and existing products. Their intention is to (with the objective of increasing the firm’s sales):

- better address customer needs,
- open up new markets,
- newly position a company's product on the market.

The distinctive feature of a marketing innovation compared to other changes in a firm’s marketing instruments is the implementation of a marketing method not previously used by the firm. This means that it must be part of either a new marketing concept or a strategy that represents a significant departure from the firm’s existing marketing methods. These methods can either be developed by the innovating firm or adopted from other firms or

organizations in the industry (The Organization for Economic Co-operation and Development , 2005, p. 48-51).

1.2.4 Organization

The term organizational innovation signifies the creation or adoption of an idea or behaviour new to the organization. Furthermore these types of innovations can be considered responses to environmental change or methods of bringing about change in an organization (Damanpour & Evan 1984).

The Organization for Economic Co-operation and Development (2005, p. 51) defines organisational innovation as the “implementation of a new organisational method in the firm’s business practices, workplace organisation or external relations.” Their intention is to:

- increase a firm’s performance by reducing administrative or transaction costs,
- improve workplace satisfaction,
- gain access to non-tradable assets,
- reduce costs of supplies.

The distinguishing features of an organisational innovation compared to other organisational changes in a firm is the implementation of an organisational method that has not been used before in the firm and is the result of strategic decisions taken by management (Organization for Economic Co-operation and Development and Eurostat, 2005, p. 48-51).

Organizations can, in regard to this topic, cope with environmental changes and uncertainties by successfully integrating technical or administrative changes into their organizational structure that improve the level of achievement of their goals (Damanpour & Evan 1984).

Organisational innovations in business practices involve the implementation of new (Organization for Economic Co-operation and Development and Eurostat, 2005, p. 51-52):

- methods for organising routines and procedures for the conduct of work,
- methods for distributing responsibilities and decision making among employees,
- ways of organizing relations with other firms or public institutions.

For the purpose of this thesis, organizational innovation is defined as the implementation of a new organizational method in a company's business practices, workplace organization or external relations.

According to Tether and Tajer (2008) product, process, marketing and organizational innovations, are used in companies in approximately the same extent. This brings us to one of the main research questions: what types of innovations are most frequent at Apple Inc. and if there is a clean distinction between them.

According to Sawhney, Wolcott and Arroniz (2006) business innovation is the creation of substantial new value for consumers and the business itself by creatively changing on or more dimensions of the business system. Therefore one part of business innovation is about adding new value to products and not necessary new attributes. It is important to stress on the consumer as only they decide if a new innovation is worth paying for. It makes absolutely no difference at all if a company *thinks* it is innovative.

It is also important to stress that business innovation comes in many different flavours. For example Apple Inc. is known for its cool factor and has come to be perceived as the cradle of innovation within the computing industry (Tan, 2008).

Another known instance is that of Amazon.com (This Is How It's Done: Smart Business Moves, 2009). They believed that if they wanted to become the “it” store they needed to make the online shopping experience easy, safe and flawless. So employees asked friends to make mock purchases. The rehearsal was scheduled to run six weeks but was expanded to three months as the 300 testers found many glitches. When the site went live, it was virtually bugless.

Furthermore the article elaborates that business innovation has to be systemic. The innovation has to be in sync with all aspects of the company's activities. For example a great product with a poor distribution channel will fail just as dramatically as an awesome new technology that lacks end-user function and appeal.

However it is also important to point out that some companies are able to consistently visualize and bring to market innovative and profitable new products and services while so many others struggle. According to the Dehoff & Jaruzelski (2010) this is not because of the amount of money they spend on research and development.

The research furthermore points out that there is no statistically significant relationship between financial performance and innovation spending. Rather what matters is the specific mixture of talent, knowledge, team structures, tools, and processes that successful companies put together to enable their innovation efforts, and thus create products they can profitably market (Jaruzelski, Dehoff, 2010).

1.3 Other classifications of innovations

There are many other classifications of innovation in the business world that are not thoroughly covered by The Organization for Economic Co-operation and Development categorizations in the Oslo Manual. The prime reason that can be derived for this is that the definitions of innovation provided by The Organization for Economic Co-operation and Development accentuate changes in functionality as the major characteristic of innovation. However there are also other types of innovation that can highlight the degree of improvement (radical/incremental) and the magnitude of impact (disruptive/sustainable).

1.3.1 Radical versus Incremental Innovation

Garcia and Calantone (2002, p. 102) state that radical innovations embody a new technology that results in a new market infrastructure. Consequently meaning that radical innovation represents something new to the world and does not follow existing technology. It has also been studied that these types of innovations usually provide significant technological breakthroughs and create new knowledge (Ahuja & Lampert, 2001).

Radical innovations represent more revolutionary changes to the underlying technologies and the management system (Rainey, 2005, p. 45). It is correspondingly important to stress that because of the difficulty and risk involved in developing them, radical innovations are very rare (Hitt, Ireland & Hoskisson, 2007, p. 414). Synonyms for radical innovation include breakthrough and discontinuous innovation.

Garcia and Calantone (2002, p. 121) divulge further into the topic saying that radical innovations do not tackle an identified demand but instead create a one - one that is beforehand unrecognized by the consumer. The differences between the two classifications are shown below in table 1. This new demand provokes new industries with new competitors, firms, distribution channels, and new marketing activities.

Hitt, Ireland and Hoskisson (2007, p. 413) believe that radical innovations establish new functionalities for consumers and therefore successful radical innovations have strong possibility of leading to significant growth in revenue and profits for the company.

The Organization for Economic Co-operation and Development (2005, p. 58) defines radical innovation as an innovation that has a “significant impact on a market and on the economic activity of firms in that market.”

Incremental innovations include an innovation of a current product whose performance has been significantly improved or elevated. This kind of innovation can take two forms (Organization for Economic Co-operation and Development, 2005, p. 80):

- a simple product may be improved (in terms of improved performance or lower cost) through use of higher performance components or materials,
- a complex product, which consists of a number of integrated technical subsystems, may be improved by partial changes to one of the subsystems.

Garcia and Calantone (2002, p. 123) define incremental innovations as products that offer new qualities, benefits, or improvements to existing technology in the current market. It has to be well understood that markets for incremental innovations are well defined; product features are well understood; profit margins are lower; production technologies are efficient; and competition is primarily on the basis of price (Hitt, Ireland & Hoskisson, 2007, p. 413).

Most innovations are incremental due to the fact that they build on existing products and provide only small improvements. An incremental new product can comprise of the

adaptation, refinement, or enhancement of existing products (Garcia & Calantone, 2002, p. 123).

According to Yen and Wei (2009, p. 297-298) incremental innovation helps companies maintain profit and market share, while radical innovation can have three impacts on business, they can:

- push boundaries to create new potential market and detect market reactions,
- boost company image and add brand value,
- increase revenue.

Table 1: Radical vs. Incremental Innovation

Radical Innovation	Incremental Innovation
Explores new technology	Exploits existing technology
High uncertainty	Low uncertainty
Concentrates on processes and products with unique performance features.	Concentrates on cost or feature improvements in existing products, processes, marketing or organizations.

For the purpose of this thesis, radical innovation will be defined as product, process, marketing or organizational innovation that explores a new technology or unprecedented performance features and unveils new functionalities for consumers. Incremental innovation can also be either a product, process, marketing or organizational innovation that offer new advantages, benefits, or enhancements to existing technology.

1.3.2 Disruptive versus Sustainable Innovation

Disruptive innovations are defined as innovations that “create an entirely new market through the introduction of a new kind of product or service” (Christensen & Overdorf, 2000, p. 72). This can be a product or service that is essentially worse initially, as reviewed consumers. As is described by Christensen (1997), disruptive innovations do not address the next-generation needs of customers in existing markets; they however have different attributes that enable new market applications to emerge. Products based on disruptive technologies are typically cheaper, simpler, smaller, and, frequently, more convenient to use.

Sustaining innovations make a product or service perform better in ways that customers in the mainstream market already value. These kinds of innovations are breakthrough and help maintain the company’s best customers. They do this by providing better qualities in products or services than had previously been available (Christensen & Overdorf, 2000, p. 72). The differences between the sustaining and disruptive innovations are shown below in table 2.

The crucial thing to remember is that disruptive innovation is a market sensation and has little to do with technology as such. Very often disruptive innovation is advanced in usage, but not in terms of performance valued by the existing market's customer. In particular, a disruptive innovation may or may not represent a major technical breakthrough (Rao, 2007).

As seen above major advances in innovation are called radical innovations. These kinds of innovations may or may not be disruptive. The same can also be said for incremental innovations. The same can also be said for sustaining innovation, as it can be incremental involving year-by-year improvements or represent radical, breakthrough products (Rao, 2007).

As is determined by Christensen and Overdorf (2000, p. 73) sustaining innovations are generally developed and presented by well-known industry leaders, while disruptive innovations occur so intermittently that no company has a routine process for handling them. It is furthermore recognized that industry leaders are organized to develop and introduce sustaining technologies, due to the fact that they have to launch new and improved products on a monthly or yearly basis to gain an edge over the competition.

These industry leaders do this by developing processes for evaluating the technological potential of sustaining innovations and for assessing their customers' needs for alternatives. Investment in sustaining technology also fits better with these types of innovations as they promise higher margins from better products sold to leading- edge customers, while disruptive products nearly always promise lower profit margins per unit sold and are not attractive to the company's best customers, they're inconsistent with the established company's values (Christensen & Overdorf, 2000, p. 73)

Table 2: Disruptive vs. Sustainable Innovation

Disruptive Innovation	Sustainable Innovation
Create an entirely new market through the introduction of a new kind of product or service.	Make a product or service perform better in ways that customers in the mainstream market already value.
Does not address the next-generation needs of customers in existing markets	Addresses the next-generation needs of customers in existing markets.
Product that is cheaper, simpler, smaller, and more convenient to use.	Better product that they can sell for higher profit margins to their best customers.
No company has a routine process for handling them	Generally developed and presented by well-known industry leaders
Can involve radical or incremental innovations.	Can involve radical or incremental innovations.

For the needs of this thesis, disruptive innovation will be defined as a product, process, marketing or organizational innovation that creates an entirely new market with the introduction of this innovation. This innovation can therefore create a dramatic change and transform existing markets or create a new one. Sustainable innovation is defined as a product, process, marketing or organizational innovation that improve competitiveness with the current market.

1.4 Models of Innovation

1.4.1 Linear Models of Innovation

Starting in the 1960's, researchers became interested in the "specific processes that generate new technologies and the learning involved in technological change" (Marinova, Phillimore, 2003, p. 46). The belief was that understanding innovation would stimulate research and development and consequently inspire the development of new products and processes. Soon after innovation started to be seen as a sequence of activities that lead to new technologies being adopted by the markets (Marinova & Phillimore, 2003, p. 46).

There are two basic variations of the linear model of innovation:

1. technology push and
2. market pull.

For the technology push model, as is shown in figure 2, it is presumed that researchers make unexpected discoveries, afterwards technologists employ them and cultivate product ideas and engineers and designers turn them into prototypes for testing. Manufacturing has to devise ways of producing the products efficiently and marketing and sales have to promote the product to the potential consumer.

Figure 2: Technology Push Model of Innovation



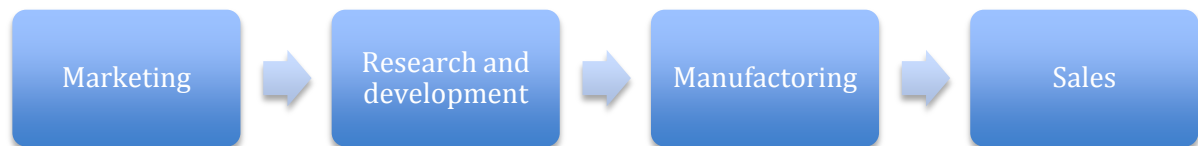
Source: P. Trott, Innovation Management and new product development, 2005, p. 23.

This model credits innovation potential wholly to the ability of research in generating advancements in science, which would provide knowledge enough for the companies to generate innovations. It has been highlighted, by Marinova and Phillimore (2003), that the above model dominated industrial policy after the Second World War. The negative aspect of this model is that it can be applied in only a few known cases in particular where the innovation process follows a different path.

The market pull model was developed in the 1970's because of new studies that stressed the importance of the marketplace and the demands of potential consumers of technology.

The customer need-driven model, as is shown in figure 3, highlights the function of marketing as an initiator of original ideas resulting from close interactions with customers. These are conveyed to engineers and designers to produce prototypes and then to manufacturing for production. In fast-moving consumer goods industries the role of the market and the customer remains powerful and very influential.

Figure 3: Market Pull Model of Innovation



Source: P. Trott, *Innovation Management and new product development*, 2005, p. 23.

Schmookler (1962) was the first who considered and studied patterns in patents and investments are the main exponent of demand led innovation. His conclusion was that fluctuations in investments could be explained better by external events (demand) than by trends in inventive activities.

1.4.2 Interactive Models of Innovation

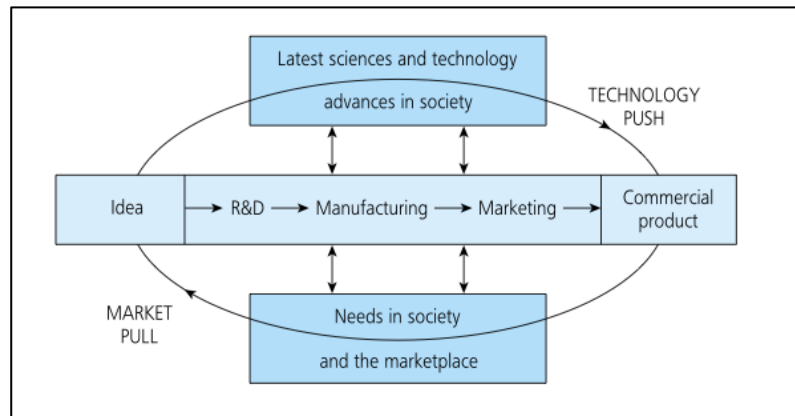
As can be deduced from the figure 3, linear models represent an extremely simplified picture of the normally complex connections happening during the innovation process. It can therefore be acknowledged that there is a need for deeper understanding and description of all the aspects and actors of the innovation process. Here is where the interactive model comes in and develops this idea further, linking together the technology-push and market-pull models (Marinova, Phillimore, 2003, p. 47).

While still extremely simplified, this is a more complete depiction of the innovation process. The complete innovation process is set so it transfers knowledge between a complex set of communication paths. These paths include internal and external linkages. As can be seen in figure 4 the innovation process represents the organization's capabilities and its linkages with both the marketplace and the science base.

The first thing to point out is that as can be seen there is no explicit starting point. The use of information flows and is used to explain how innovations transpire and that they can arise from a wide variety of points. Beiji (1998, p. 19) points out that innovation is no longer the end product of a final stage of activity but can occur at various places throughout the process.

The organizational functions of research and development, engineering and design, manufacturing and marketing and sales are in the centre of the innovation process. At first glance the model may appear linear, however it is important to point out that flow of communication is not necessarily linear. From this it can also be seen that relations are happening between the science base and the marketplace occur on all functions.

Figure 4: Interactive Model of innovation



Source: P. Trott, *Innovation Management and new product development*, 2005, p. 25, Figure 1.7.

However this model does still not clarify what drives the engine of innovation, why some companies are better at doing it than others or how organizations learn and what is the role of their internal environment.

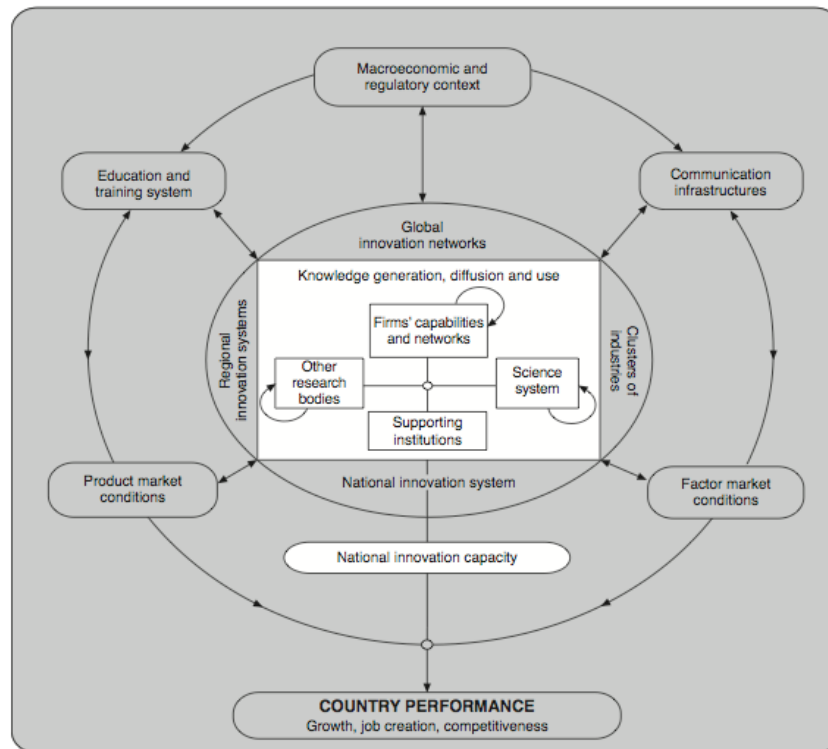
1.4.3 System Models of Innovation

The System model (Figure 5) maintains that companies that “do not have large resources to develop innovation in-house, can benefit from establishing relationships with a network of additional firms and organizations” (Marinova & Phillimore, 2003, p. 47). Therefore this model underlines the importance of interaction among the innovation network and the systematization of the factors involved in the innovation process.

Edquist (1997) lists nine characteristics of the systems model:

1. innovations and learning are at the centre of the model,
2. the model offers a holistic and interdisciplinary approach,
3. a historical perspective is natural,
4. there are differences between systems and there is no optimality,
5. the model emphasizes interdependence and non-linearity,
6. the model encompasses product technologies and organizational innovations,
7. the model points to the central role of institutions,
8. there is a place for various kinds of ambiguities and diffusion of concepts and
9. the model provides a broad conceptual framework rather than formal theories.

Figure 5: Systems Model of Innovation



Source: *Organization for Economic Co-operation and Development, Managing National Innovation Systems, 1999, p. 23, figure 4.*

The Organization for Economic Co-operation and Development (2005, p. 29) outlines that the basic arrangement shows that all the connections that are part of the innovation process are complex and established. This model is very significant because it shows the elements needed within a company for innovation capability. The most well known systems model is the National systems model of innovation, which concentrates on the diversity in approaches to innovation from countries around the globe. These may differ in size, level of economic development, historical traditions or level of concern about specific policy problems (Marinova & Phillimore, 2003, p. 48).

The Organization for Economic Co-operation and Development (1999, p. 24) defines the national innovation systems as the “set of distinct institutions which jointly and individually contribute to the development and diffusion of new technologies and which provide the framework within which governments form and implement policies to influence the innovation process.” As such this model represents a system of interrelated institutions that create, store and transfer the knowledge and skills through which they define new technologies. From this perception, the innovative performance of an economy depends not only on how the individual institutions perform in isolation, but on how they interact with each other as and how they interplay with social institutions.

The Organization for Economic Co-operation and Development (1999, p. 24) divides the National Systems model of innovation into three levels:

1. **Micro level** focuses on the internal capabilities of the firm and on the links surrounding one or a few firms

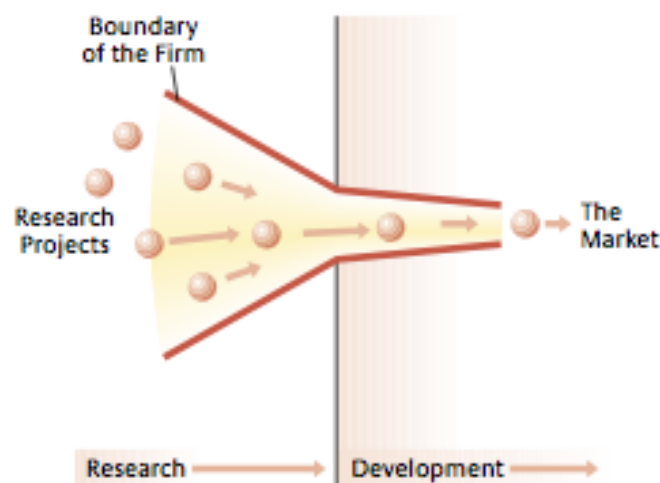
2. **Meso level** examines knowledge links among interacting firms with common characteristics
3. **At the macro level** examines the economy as a network of interlinked sectorial clusters or as a network of institutions and maps knowledge interactions among and between them.

There are quiet a few advantages of this model, one of them being that groups of small firms can maintain leading edge technologies by using the support of the other organizations within the network; secondly skill accumulation and collective learning occurs within the network and benefits all participants; thirdly the network promotes flows of key individuals between firms therefore skills can be combined and re-combined to overcome bottlenecks; innovation time and costs can be reduced; the network provides entry into the industry for small innovative firms and lastly individual firms within the network operate with high flexibility and in low cost ways, including small overheads (Marinova & Phillimore, 2003, p. 48).

1.4.4 Open and Closed Models of Innovation

The underlying assumption of the closed innovation is that successful innovation requires control (Chesbrough, 2003, p. 36). With a closed model of innovation, a company generates, develops and commercializes its own ideas. Fundamentally this model follows the philosophy of self-reliance: you want something done right, you have got to do it yourself. It dominated the innovation processes of many leading industrial corporations for most of the 20th century (Davenport, Leibold & Voelpel, 2006, p. 136).

Figure 6: Closed Model of Innovation



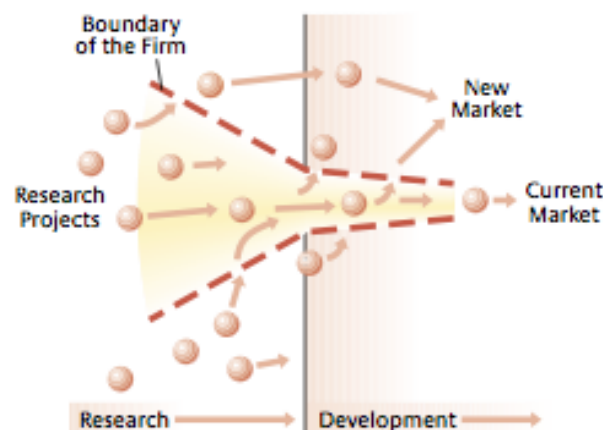
Source: H. Chesbrough, The Era of Open Innovation, 2003, p. 36.

Chesbrough (2003, p. 37-38) describes how the logic of closed innovation was the way to go for years and how it was self-evident as the right way to bring innovations to market. He believed that successful companies all played by two unspoken rules. One being that these companies invested more heavily in internal research and development than their

rivals and hired the best and the brightest. This allowed them to discover the best and greatest number of ideas, hence becoming the first to have this kind of innovation. This in turn would facilitate them to aggressively protect and control their intellectual property and prevent others from using it. They could then reinvest the profits into the innovation process. With which they developed additional innovation, creating a virtuous cycle of innovation.

In open innovation “a company commercializes both its own ideas as well as innovations from other businesses and seeks ways to bring its in-house ideas to market by deploying pathways outside its current businesses” (Davenport, Leibold & Voelpel, 2006, p. 137). Chesbrough (2003, p. 37) points out that the line between the firm and its surrounding environment has to be permeable and enable innovations to move more easily between the two areas. As Maxwell (2009, p. 32) believes many companies are now working on having around 50 % of new products coming from outside their own company. He furthermore believes that companies are appreciating that there is an enormous pool of creative talent outside of their company that can be potentially recruited, particularly for the early phase of innovation.

Figure 7: Open Model of Innovation



Source: Henry W. Chesbrough, *The Era of Open Innovation*, 2003, p. 36.

There are many different possibilities of partnering up with different types of creative talent. A company can partner up with universities, competitors, suppliers, customers, suppliers, etc. It is said that universities are constantly embracing this new concept and adopting business models that facilitate the partnering with companies in early stage innovation. Small start-up companies are highly innovative and generally quickly develop new technology with enormous risk of failure but that could lead to new products that may have the potential to become something special (Maxwell, 2009, p. 32-33).

A good example of how a large company has implemented open innovation is Proctor and Gamble uses open innovation in their Connect and Develop Model. The idea behind the model is to bring together external research institutions, suppliers, consumers, individuals and competitors to develop the market for new products. The first step in this model is the

company puts all their needs on their website in classified categories. Consequently anyone who is interested or has the solution to their needs can propose their ideas, which then get evaluated by a specialized team (Connect and develop website).

The differences between the closed and open model of innovation are described in table 3.

Table 3: Closed versus Open Innovation Principles

Closed Innovation Principles	Open Innovation Principles
The smart people, in our field, work for us.	Not all of the smart people work for us so we must find and tap into the knowledge and expertise of bright individuals outside our company.
To profit from R&D, we must discover, develop and ship it	External R&D can create significant value; internal R&D is needed to claim some portion of that value.
If we discover it ourselves, we will get it to market first	We don't have to originate the research in order to profit from it.
If we are the first to commercialize an innovation, we will win.	Building a better business model is better than getting to market first.
If we create the most and best ideas in the industry, we will win.	If we make the best use of internal and external ideas, we will win.
We should control our intellectual property (IP) so that our competitors don't profit from our ideas.	We should profit from others' use of our IP, and we should buy others' IP whenever it advances our own business model.

Source: H. Chesbrough, The Era of Open Innovation, 2003, p. 37.

1.5 Innovation Strategies

According to Gilbert (1994) innovation strategy can be defined as to what degree and in what way a company attempts to use innovation to execute its business strategy and improve its performance. He suggests that two different innovation strategies exist: Proactive and Reactive.

Proactive innovation strategy is consistent with a company that produces disruptive innovations created by few entrepreneurial individuals. The author goes on to indicate that proactive innovators must have a tolerance for failure, along with a strong focus on the key innovation that will change the competitive structure of an industry.

Reactive innovation strategy emphasize on the adoption of inventions of other companies. Therefore these companies stay current on what inventions are being introduced, how they are being received, and how they could imitate the product.

Gilbert (1994) concludes that even though reactive seems less vigorous than the proactive innovation strategy, neither is always nor automatically better. Both innovation strategies have their advantages. He establishes that a company must choose the strategy that better fits its history, resources and future goals. The company must then follow it consistently and therefore avoid mistakes and profits from innovations are more likely to follow.

Dehoff and Jaruzelski (2007, p. 3) identified three distinct innovation strategies in their yearly findings. They divided them into:

1. need seekers,
2. market readers,
3. technology drivers.

Need seekers identified their innovation priorities as being the first to market and basing research and development on getting direct and proactive input from their potential consumers. The first step (the innovation phase) of such a company is to select a consumer base then collect consumer insights and explore customer needs. In the next step the company then tries to find an innovation and evaluate it to find what the return on innovation investment would be. Then in the phase of product development the company designs the product to respond to consumers needs and priorities. In the final part of the innovation process the company successfully launches and positions the product (Dehoff & Jaruzelski, 2007, p. 6-8).

Market readers observe their markets carefully and conserve a more guarded approach, focusing mainly on creating value through incremental change (Dehoff & Jaruzelski, 2007, p. 3). The report even states that market readers are apt to bring those incremental product innovations into the market as the second mover and prefer a low-risk approach to product introduction. The first step in their strategy is conducting market research and gathering competitive intelligence. With this they then maintain strong process discipline and bring products to market quickly emphasising on increased modularity and simplicity. At the commercial part of the process they manage the product life cycle and retirement (Dehoff & Jaruzelski, 2007, p. 6-12).

Technology drivers generate product ideas from their technological capabilities, leveraging their investment in research and development to drive breakthrough innovation and radical change, often seeking to solve the unarticulated needs of their consumer. Rather than following the market they focus on unarticulated consumer need, which implies high-risk innovation. These kinds of companies scout new technologies and map emerging technologies and try to analyse trends. The products are then tested rigorously for quality and ease of use before capturing the consumer markets with mostly successful products (Dehoff & Jaruzelski, 2007, p. 6-14).

Dehoff and Jaruzelski (2007) also conclude similarly as Gilbert (1994) that a company must choose the approach that best suits and is most closely aligned with its business strategy and the competitive environment in which the company operates.

1.6 Company Innovation Rankings

Companies around the world have started to get critically reviewed for their innovation capabilities. Forbes.com, who conducted their latest Global Innovation 1000 study with *Booz & Company*, surveyed more than 450 innovation executives at more than 400 different companies from more than 10 different industries around the world. They requested them to identify the companies they thought were the most innovative in the last year. Their survey participants’ mutual opinion implies that their views are very much in line with popular perception (Jaruzelski & Mainardi, 2011).

The report closes declaring that companies that are perceived to be highly innovative are clearly successful in creating new products and bringing them to market. Some spend more than others to accomplish this goal, but the real winners, financially speaking, are those companies that can innovate successfully without breaking the bank (Jaruzelski & Mainardi, 2011, p. 12).

Table 4: The 10 Most Innovative Companies

Report		Global Innovation 1000 study <i>Booz & Company</i>	The Most Innovative Companies <i>Boston Consulting Group</i>
Top 10 companies	1.	Apple	Apple
	2.	Google	Google
	3.	3M	Microsoft
	4.	General Electric	IBM
	5.	Toyota	Toyota
	6.	Microsoft	Amazon.com
	7.	Proctor & Gamble	LG Electronics
	8.	IBM	BYD Company
	9.	Samsung	General Electric
	10.	Intel	Sony Corporation

Sources: B. Jaruzelski & K. Dehoff, *The Global Innovation 1000- How the Top Innovators Keep Winning*, 2010, p. 12; J. Andrew, J. Manget, C.D. Michael, A. Taylor & H. Zablitz, *Innovation 2010: A Return to Prominence and the Emergence of a New World Order*, 2010, p. 16.

The *Boston Consulting Group*, working in partnership with BusinessWeek, surveyed 1,590 executives representing all major markets and industries. One of the reports biggest findings suggests that a new world order is evolving, led by China, India, and Brazil, progressively assuming more prominent roles, while the United States and the other mature economies continue to play major roles but gradually become less dominant. This is also reminiscent of the below results as less than half of survey respondents believe that U.S. companies will remain the most innovative over the next five years (Andrew, DeRocco & Taylor, 2009, p. 10).

The rankings on the above table are based on a combination of the above report's survey responses (80 %), three-year total shareholder return (10 %), three-year revenue growth (5 %), and three-year margin growth (5 %).

Another recent list was chosen by the editors of Technology Review, who look for companies that are setting the agenda in an increasingly important market, on the verge of disrupting an established market, or creating an entirely new market. In choosing the TR50 they picked companies with the year's most important inventions and breakthroughs but also selected companies that are successfully growing businesses and markets around innovative new products.

Table 5: Technology Review TR 50 2011 (in alphabetical order)

1366 Technologies	First Solar	Nissan
A123 Systems	Fluidigm	Novomer
Adobe	GE	Obopay
Akamai	GlaxoSmithKline	Pacific Biosciences
Alnylam	Google	Plastic Logic
Amazon.com	HTC	Prime View International
American Superconductor	Hulu	Serious Materials
Amyris	IBM	Solyndra
Apple	Illumina	StreamBase
Applied Materials	Infinera	Suntech
AthenaHealth	Intel	Synthetic Genomics
BIND Biosciences	iRobot	Tesla Motors
Complete Genomics	Joule Biotechnologies	Tilera
Coskata	Luxtera	Twitter
DuPont	Medtronic	Ushahidi
eSolar	Nanosphere	Yelp
Fate Therapeutics	Nissan	Zynga

Source: The 50 Most Innovative Companies 2011, 2011.

As can be seen from the above sources many companies appear on all three lists. Does this mean that they are truly the most innovative companies in the world? As can be seen in the above tables Apple Inc. is listed as the leader in innovation in the first two studies, and is followed closely by Google.

The Global Innovation 1000 Study states that Apple is an exceptional example that success in innovation is determined not by how much money you spend, but rather by how you spend it. The report furthermore states that Apple invests just 3.1 percent of its revenues in research and development, which according to the study, is less than half the average percentage of the computing and electronics industry. Apple has held the top spot in the Boston Group Consulting Group survey since 2005.

In analysis to all of these studies the question that arises is what does Apple Inc. have or know in order to remain the company that is perceived to be the most innovative in the world. This issue requires an in depth study of Apple Inc.

2 REDIFINING INNOVATION: A CASE STUDY OF APPLE INC

2.1 Methodology

The research methodology that will be used in the thesis is case study research as it is appropriate for answering "how" and "why" questions, which are asked about a contemporary set of events over which the researcher has little or no control. A case study was also used because it supports an empirical inquiry that investigates a contemporary phenomenon within its real-life context. This is useful in the case of innovation as the boundaries between phenomenon and context are not clearly evident (Yin, 2003).

This methodology is also appropriate for innovation in relation to Apple Inc., as it is recommended for researching an emerging area (Yin 2003). When trying to understand innovation it is most rational to look at the company that is, on a global scale, seen as the most innovative in the world.

The six sources identified by Yin (2003, p. 83) are documentation, archival records, interviews, direct observation, participant observation, and physical artefacts. In this thesis documentation, archival records and direct observation will be used, as these are the only three accessible sources for this study. The strengths of documentation as a source of evidence is that it is stable and can be reviewed multiple times; unobtrusive because it was not created as part of the case study; exact because it contains exact names, references and details; and has a broad coverage. Weaknesses also arise as documentation is biased if not looked at completely and also if it reflects the bias of one person or company.

Archival records will also be used; their main strength is their preciseness, while their main weakness is often accessibility. This is true in the case of Apple Inc. their public statements and quarter results are the only primary source of data available from the company in most instances. Direct observations are useful in providing additional information about the topic as in our case where they help understand actual uses of Apple's technology. The weakness of direct observations is bias due to the author's manipulation and bias of events.

As the case study will focus on classification of innovations that Apple has already introduced to the market, the main findings will be derived from secondary sources detailed above. This will be adequate for the thesis as the information required is already in the public domain. The research and development process of innovations at Apple Inc. will not be our main research objective, for such an objective primary sources would be needed to construct a complete picture of the innovation culture inside the company. Primary sources from Apple Inc. are not widely available, as they are usually under non-disclosure agreements and not available to the public.

According to Eisenhardt (1989) case studies can be used to accomplish various aims: to provide description, test theory or generate theory. The interest here is to test theory in order to see, if the theories behind innovation can be used in practice and furthermore to see if we can then generate a theory in seeing what makes Apple, as a company, innovative.

The first step in conducting the case study will be to develop the instrument to differentiate the types and classifications of innovations. This will be done by researching the theory behind innovation and the different sources of information and connecting the concepts with the case study of Apple Inc. Moreover this will help us identify and extract the most innovative products of Apple Inc. Lastly we will concentrate on each product individually and place them in a category whilst seeing if it is as simple a distinction as is defined in theory.

The greatest concern about case study research is the lack of rigor of case study research, as many times, case studies are done carelessly and do not follow a systematic approach. Additionally, bias can enter more frequently and be less frequently overcome (Yin, 2003, p. 11). In general, criticisms about single-case studies usually reflect fears about the uniqueness or artificial conditions surrounding the case.

In connection with building theory from cases, the main weakness is that it may result in narrow and idiosyncratic theory (Eisenhardt, 1989). Yin (2003) notes that case studies provide little basis for scientific generalization. To conclude the goal of case studies is to generalize and not “particularize” analysis and apply it in a larger scale.

2.1.1 The method used to differentiate the types and classifications of innovations

As described above, the first step in conducting the case study will be to develop the instrument to differentiate the types and classifications of innovations. This instrument will be based on the classification of innovations into radical, incremental, disruptive and sustainable innovations because they provide a look at the innovation as a whole. These classifications cover all innovations, therefore all innovations can be divided into one category.

The aspects of the innovations analysed will be on the technology and market impact. The technology impact will be analysed to see if the innovation is entirely new or just an advancement of existing technology. The market impact will be viewed to see if the innovation creates a new or transforms an existing market. Likewise this classification method gives every innovation a classification and therefore provides us with a potential to make a valuable conclusion. Below are the definitions that will be used in this thesis in order to allocate the different product innovations from Apple Inc. into allotted quadrants.

The quadrant that represents the *radical disruptive* innovations describes products that involved a totally new technology and at the same time created a dramatic change and create new markets. Products in this quadrant represent something new in the world and at

the same time are simpler, smaller and easier to use than anything before. Furthermore these products do not satisfy existing demand but rather create a demand that was previously unrecognized by the consumer.

The *radical sustainable* innovations quadrant describes products that offer a completely new technology in an existing market. The product addresses the next generation needs of consumers while at the same time creating a demand that was before unrecognized by the consumer. Furthermore the new product changes the existing market so thoroughly that competitors have to play catch-up in order to regain their part of the market.

The *incremental disruptive* innovations quadrant describes products that exploit existing products while concentrate simply on the cost or feature improvements. This product can create a dramatic change and transform existing markets or create a new one. At the same time this product can still improve competitiveness within current markets and give consumers a renewed product. A renewed product is an already existing product, which was updated in some way.

The quadrant *incremental sustainable* innovations describes products that are not technologically challenging however still address the next generation needs of consumers in the mainstream market that consumers already value. This product can concentrate on cost or feature improvements and create higher profit margins for the company. This product can also improve competitiveness with the current market.

Figure 8: Degree of Improvement versus Magnitude of Impact

		DEGREE OF IMPROVEMENT	
		RADICAL	INCREMENTAL
MAGNITUDE OF IMPACT	DISRUPTIVE	Radical Disruptive Innovation	Incremental Disruptive Innovation
	SUSTAINABLE	Radical Sustainable Innovation	Incremental Sustainable Innovation

In order to better distribute innovations into quadrants more than one interpretation is required. The two experts used in this analysis were chosen because of their prior knowledge of the company and their background in business studies. To more comprehensively familiarize both respondents with innovation, both read the above history

and theory of innovation and read various sources to familiarize themselves in-depth with the company and historical products.

They were then given the following list of 15 products:

1. Apple II
2. Lisa
3. Macintosh
4. Laserwriter
5. Newton
6. Quicktake
7. QuickTime
8. iMac
9. iPod
10. iPod Touch
11. iTunes & App Store
12. iPhone
13. Apple TV
14. iPad
15. Macbook Air

These products were chosen by the author based on their importance in the company's history. The experts had to familiarize themselves with the product and answer the following questions, which would then instruct them which quadrant they should place the product in. Their questions were only two questions:

1. Does the product embody a new technology?
2. Does the product fit into an existing market?

Based on those two answers they placed each product in one of the quadrants

After doing this individually, a discussion emerged about the products, which the respondents had conflicting understandings on. Only few differences occurred which could be solved with the help of the author. The findings below are based on the responses of the two respondents and the author.

For the below classifications the following definitions were used:

- 1) If the innovation explored a new technology and created a new market it should be placed in the radical disruptive innovation quadrant. Products in this quadrant represent something new in the world and at the same time are simpler, smaller and easier to use than anything before.
- 2) If the innovation explored a new technology and emerged in an existing market it should be placed in the radical sustainable innovation quadrant. The product addresses the next generation needs of consumers while at the same time creating a demand that was before unrecognized by the consumer.
- 3) If the innovation explored a known technology and created a new market it should be placed in the incremental disruptive innovation quadrant.

- 4) If the innovation explored a known technology and emerged in an existing market it should be placed in the incremental sustainable innovation quadrant.
- 5) New technology is technology that is represented differently has never been seen before in a product or service.
- 6) Known technology is technology that has been used in previous products or services. However in respect to innovation, known technology is technology that is used in a different way than before.
- 7) A new market is a market that didn't exist before this product was introduced.
- 8) An existing market is defined as a market where products or services already exist.

The number of innovations will be distributed into the different categories from which we will attempt to see a pattern in the classifications of innovations at Apple Inc.

Apple's products will be divided into three areas: computer hardware, devices and software. Products that are not personal computers or software will be put in the devices category. To understand the current product categories, a study of the company's previous products will also be made. Firstly the history of the company will be presented, followed by the three above defined chapters. Lastly the company's innovation environment and models of innovation will be described.

2.2 Company History

“Apple Inc. designs, manufactures, and markets mobile communication and media devices, personal computers, and portable digital music players, and sells a variety of related software, services, peripherals, networking solutions, and third-party digital content and applications. The Company sells its products worldwide through its retail stores, online stores, and direct sales force, as well as through third-party cellular network carriers, wholesalers, retailers and value-added resellers. In addition, the Company sells a variety of third-party iPhone, iPad, Macintosh (“Mac”), and iPod compatible products including application software, printers, storage devices, speakers, headphones, and various other accessories and supplies through its online and retail stores. ” (Quarterly results for Q4, 2011)

Steve Jobs and Steve Wozniak founded Apple Computer on April 1 1976 in the Santa Clara Valley, California (O'Grady, 2009, p.2). They started building Apple computers in Steve Jobs' parents' living room and later moved the production into the garage, where they built a computer circuit board, the Apple I. Within several months, they had sold 200 units and taken on a new partner Michael Markkula. He was a freshly minted millionaire and was instrumental in attracting venture capital (Yoffie, 2008, p. 2). The roles in the company were divided (O'Grady, 2009, p.2):

- Markkula was the experienced businessman on the team,
- Wozniak was the technical genius, and
- Jobs' was the visionary.

In February 1977 Michael M. Scott joined Apple as its first president, as Markkula believed that the company needed experienced leadership if it was going to grow (Linzmayr, 2004, p. 11). In early 1977, Regis McKenna was hired for advertising, as he defined the new logo, that is still used today, and logotype of Apple and created its first professionally produced ads.

In December 1980, Apple Computer Inc. launched the Initial Public Offering of its stock to the investing public (O'Grady, 2009, p.6). The stock was originally filed to sell at \$14 a share, however the stock opened at \$22 and all 4.6 million shares sold out in an hour (Young & William, 2005, p. 63). The stock rose nearly 32 percent on its first day of trading, and closed at \$29 (Linzmayr, 2004, p. 54). By 1981, Markkula replaced Scott as president, and Jobs replaced Markkula as chairman (Linzmayr, 2004, p. 22).

In 1983 Sculley joins Apple as president, CEO. In 1985 the final battle erupted between Jobs and John Sculley, Apple's new CEO. This led to the Jobs' resignation, as the Apple board took Sculley's side and removed most decision-making process away from Jobs and gave them to Sculley. Steve Jobs resigned on the 28th of May 1985 (Young, 2005, p. 105).

Steve Jobs later described, "The trouble with Apple is it succeeded beyond its wildest dreams". We succeeded so well, we got everyone else to dream the same dream. The rest of the world became just like it. The trouble is the dream didn't evolve. Apple stopped creating."

On February 19, 1987, Apple registered the "Apple.com" domain name, making it one of the first hundred companies to register a .com address on the nascent Internet.

In 1993 Sculley was replaced by Spindler as the new CEO of Apple, after three years also Spindler was replaced by Gil Amelio. . Amelio was known at the time for his cost cutting techniques and his main goal was to bring the company back to profitability. As he put it himself: "Apple is like a ship with a hole in the bottom, leaking water, and my job is to get the ship pointed in the right direction" (Steidler-Dennison, 2009, p. 27).

Amelio believed that Apple's key problems included "a shortage of cash and liquidity, low quality products, lack of a viable operating system strategy, undisciplined corporate culture, and fragmentation". To resolve these problems Amelio cut costs and reduced Apple's work force by one third (Steidler-Dennison, 2009, p. 27).

In November 1996 Amelio started discussions with Steve Jobs' NeXT to help innovate a new operating system for the Mac. Apple bought the NeXT on 4 February 1997 for \$429 million. This opened up way for Steve Jobs to return to Apple in 1997. Firstly Steve Jobs returned to Apple as a special advisor to help transition NeXt into Apple (O'Grady, 2009, p. 149).

Amelio was removed as CEO by the Apple board after the company suffered crippling financial losses in the second quarter of 1997. Moreover the Apple board asked Steve Jobs

to be CEO, but he would only agree to be “interim CEO” for a period of six months, while he helped seek a permanent CEO.

During this time, Jobs began restructuring of the company (O’Grady, 2009, p. 149). Jobs eventually became CEO and served in that position until August 2011. Jobs also became focused on reenergizing Apple’s image. Apple Inc. began promoting itself as a hip alternative to other computer brands (Yoffie, 2008, p. 4).

On the 24th of August 2011 Apple Board of directors announced that Steve Jobs had resigned as CEO and named Tim Cook, previously Apple Chief Operating Officers, as the new CEO.

Tim Cook had at the time been at the company for 13 years and was responsible for “all of the company’s worldwide sales and operations, including end-to-end management of Apple’s supply chain, sales activities, and service and support in all markets and countries. He also headed Apple’s Macintosh division and played a key role in the continued development of strategic reseller and supplier relationships, ensuring flexibility in response to an increasingly demanding marketplace” (Steve Jobs Resigns as CEO of Apple, 2011).

On October 5 the company (Statement by Apple’s Board of Directors, 2011) announced that their co-founder, chairman, and chief executive officer, Steve Jobs, had died.

2.2.1 Computer Hardware

Apple I was the first product of Apple, a personal computer, went on sale in July 1976 at a price of \$666.66. The Apple I stood out among other computers because it enabled using a keyboard and an ordinary video monitor, although neither of these was included in the base price. This was something new at the time. About 200 units were produced and sold and evidently paved the way for a new company in the personal computer business (Linzmayr, 2004, p. 5-7).

Many of the design features of the Apple I were limited due to the small amount of money they had to construct it. So when Wozniak started to build the Apple II he was able to use the income from the sales of Apple I. Consequently he was able to create a greatly improved machine. The product was presented to the public at the first West Coast Computer Faire in 1977. The main feature of the machine was that people could use it straight out of the box (O’Grady, 2009, Young, William 2005; Linzmayer, 2004). O’Grady (2009, p. 3) describes the Apple I as a “smash hit, and the Apple II eventually took credit for what we now know as the personal computer”.

The above statement by O’Grady (2009) can be acknowledged mainly because Wozniak and Jobs made a key decision about the operating system. Other computers on the market were using the Basic Programming language that had been written by Gates and Allen. The cost of their operating system for a computer was \$500.

Wozniak and Jobs decided that they would provide a programming language that would be free to the user. Furthermore the Apple II would load its operating system automatically unlike competitor's machines and made the start-up process easier. This feature made the Apple machine something special as programmers could write applications for the computer and sold them to clients (Young & William, 2005, p. 37).

In the 1980s, Apple Computer faced increasing competition from IBM and Commodore, because it posed threat in the business computer market. At the beginning of 1980 Apple decided that the next computer they were going to build, would be designed primarily for business users. The Apple III was launched in May 1980 at the National Computer Conference (Yoffie, 2008, p. 2). As Wozniak stated "We had to put chips in to disable some Apple II features so people's heads would have the right image that Apple III's are for business and Apple II's are for home and hobby" (Linzmayr, 2004, p. 41).

Apple III turned out to be a failure. A big concern was the higher price than its competitors. Secondly the chips were prone to failure after long periods of use, which was furthermore more sensitive because the computer did not have a fan for cooling it down. Evidently Steve Jobs wanted the computer to operate silently, he wanted the heat generated by the electronics to be dissolved through the enclosure. Regrettably, the physical design was not sufficient to cool the components inside it and inevitably the product was overheating (O'Grady, 2009, p. 7; Young & William 2005. Subsequently the company had to replace 14000 of them (Linzmayr, 2004, p. 43).

One year after the Apple III was announced, IBM unveiled its Personal Computer. This product's success was also due to Apple III's poor reliability as business users fled to the more reliable system, Microsoft's DOS (Yoffie, 2008, p. 2; O'Grady, 2009, p. 7).

In 1983 the Lisa computer was launched, which originated from Job's visit of the Xerox Research Centre in 1979. Jobs decided that the Graphical User Interface was the future of computing and would be used in Apple's next project. Lisa became a product where they were trying to do everything that could possibly be done with a computer (Young & William, 2005, p. 62). The price, which was originally set at \$2,000 went out the window and was eventually sold for \$10,000. The price was one of the main reasons that accounted for its failure.

By most accounts, Lisa was a failure, selling only around 10,000 units. The research and development cost Apple more than \$150 million to develop the computer while only bringing in \$100 million in sales for a net \$50-million loss (O'Grady, 2009, p. 71-73). Lisa was discontinued in 1985 (O'Grady, 2009, p.7).

The Macintosh was announced in October 1983 with an expensive, now famous, television commercial named "1984". The notion behind this computer was to produce an easy-to-use and inexpensive computer that included everything an end-user could want. This was the first Apple computer that shipped with a mouse input device and a graphical user interface. The Macintosh was the first computer where Apple invested a lot of money into

advertising. Yet the Mac's slow processor speed and a lack of compatible software limited its sales.

Until the mid nineties the Apple II and Macintosh evolved into new updated models. Apple II was succeeded by the Apple II Plus in 1979, the Apple IIe in 1983, the Apple IIc in 1984, the Apple IIGS in 1986 and the Apple IIc Plus in 1988. The Macintosh was succeeded by the Macintosh IIx in 1988, the Macintosh IICx and the Macintosh IICi in 1989, the Macintosh IISI and Macintosh IIfx in 1990 and the Macintosh IIVi and IIVx in 1993. A new compact Macintosh was also introduced in 1984, which was based on the same system as the original Macintosh, only that it was portable (The Apple Museum).

During this time the main objective at Apple was to release many models with hundreds of configurations. The initial price of the Macintosh was elevated, helping the company increase profits and spend more on advertising. Apple responded to the growing opposition from IBM with new products: the Performa, Centris, and Quadra. These variations were not very successful as they deviated from Apples simplicity. As there were too many models to choose from and only minimally differentiated from each other in technology specifications the sales of the product suffered (Linzmayer 2005, p. 50; O'Grady, 2009, p. 12; Yoffie, 2008, p.4).

In 1989, Apple introduced the Macintosh Portable; the first Macintosh computer could be battery powered and portable. However, its price (\$6500), size, and weight made actual portability nearly impossible. It was received with excitement from critics but very few were sold (Yoffie, 2008, p. 4; O'Grady, 2009, p. 64; Linzmayer, 2004, p. 45).

In 1991, Apple combined forces with its rival IBM to form an alliance. The two companies agreed to develop the PowerPC (with IBM and Motorola), better integrate Macs into IBM enterprise networks, develop a Unix-based operating system, form Taligent (to develop and license an object-oriented operating) and form Kaleida Labs. (to develop and license multimedia software) (Hof, Depke, Levine, Schwartz, 1991). Kaleida was dissolved in the late 1996, Taligent in 1998. Furthermore Apple had stopped developing and using the PowerPC technology in their computers by 2005 (O'Grady, 2009, p.20).

In 1991 Apple introduced the PowerBook 100 series, which established the modern form factor and ergonomic layout of laptop computers (Hornby, 2005). The modern form factor of portable computers is referred to the fold or hinge between the screen and the keyboard. In their first year on the market, PowerBooks generated over \$1 billion in sales and dethroned other competitors in the portable market (Hornby, 2005). Every couple of years Apple released updated versions until 2005, when its successor the MacBook Pro was announced.

In 1999 the first all-in-one iMac was announced (800,000 iMacs Sold in First 139 Days). Development of the iMac began immediately after Jobs' return to Apple, as he was shocked to learn that the company didn't offer a consumer model priced under \$2000

(Linzmayer, 2004, p. 194). It was marketed as "Blows minds, not budgets" and "iThink, therefore iMac" (Linzmayer, 2005, p. 302).

The iMac was marketed as the only machine that could get consumers online within 15 minutes of opening the box and set a new standard for Internet access (O'Grady, 2009, p. XIII). Apple also made it easy to import, edit and upload movies and photos onto the web and wanted consumers to view the computer as a media hub (Linzmayer, 2005, p. 52).

The iMac was also the first personal computer in more than 15 years that abandoned the floppy drive, as Apple believed that its days were numbered and rather included a CD/DVD Superdrive and USB port in the enclosure (O'Grady, 2009, p. 50-51). Critics were not so sure about this move an example is Mossberg (1998) who described this as "that one glaring mistake".

Essentially the iMac offered the consumer everything he could possibly need for \$1,299. Within the following months Apple got an unexpected number of orders: 150,000; and in the first six weeks of availability Apple sold nearly 280,000 iMacs (Linzmayer, 2004, p. 295). This product was more than simply another Mac. The iMac became the symbol of Apple's return to profitability and a turning point for computer design as a whole (O'Grady, 2009, p.13).

The all-in-one iMac was the first Mac where more than 15% of buyers were switching over from windows machines (Cruikshank, 2006, p.122) and around 30% of buyers were first time computer buyers (Linzmayer, 2005, p.295). The iMac was appealing to people who previously found computers unattractive.

The Macbook Air was introduced in January 2008. At the time it was promoted as the worlds thinnest laptop measuring only 16 mm (Apple Introduces MacBook Air—The World's Thinnest Notebook, 2008). This product was revolutionary for Apple, mostly because of its petite form factor and many feature available in thicker notebooks. Furthermore the Macbook Air introduced an entirely new category of notebook, a kind of subnotebook that Apple had never created before. The laptop was not targeted as a consumer notebook because of its \$1,800 starting price, and it wasn't a professional notebook by Apple's definition either. It was in a category all to itself (O'Grady, 2009, p. 66).

Table 6 (p. 33) shows the company's current line up of computers. It features 2 portable and 3 desktop computers.

Table 6: Current Product Line (Mac)

Product	Models				
Macbook Air	11"			13"	
	64 GB		128 GB	128 GB	256 GB
Macbook Pro	13"		15"		17"
	2.4 GHz	2.8 GHz	2.2 GHz	2.4 GHz	2.4 GHz
Mac Pro	Quad Core		8-Core	12-Core	Server
iMac	21"			27"	
	2.5 GHz		2.7 GHz	2.7 GHz	3.1 GHz
Mac Mini	Mac OS X			Mac OS X Server	

Source: Apple Inc.

2.2.2 Devices

In 1985 Apple released a laser printer with built-in PostScript interpreter, the LaserWriter (O'Grady, p. 45). Apple brought this product to market with Adobe Systems, where their joint goal was to show the world how a combination of computer and printer would be useful in day to day life (Edwards, 2010).

End users finally had real publishing tools available to them on an end-user budget with the addition of the PageMaker software. This printer allowed a user to print fonts at an enormous range of point sizes in four professional fonts. Furthermore it could output perfect curves and line or artwork anywhere on a printed page, at any size. This was also the first time a laser printer could fit on top of a desk. The LaserWriter ushered in an era of Desktop Publishing that suddenly made millions of people into home print shops (Edwards, 2010).

At the beginning of the nineties Apple had also started developing portable consumer devices and released the MessagePad, which ran the Newton operating system, in 1993. Originally this product was envisioned as a small, lightweight computer and communicator that organized ideas and information (Linzmayr, 2004, p. 184). The product included new applications such as the address book, calendar, notepad and the ability to fax and email when connected to a standard telephone line.

Newton was ahead of its time as it featured the touch screen display, the PC Card slot and the stylus (O'Grady, p. 49). The most innovative feature on this device was the handwriting recognition system. This system adapted to the user and could be trained to understand an individual's handwriting style. This was a first time the handwriting recognition software was introduced to the consumer base and became very successful-selling 50,000 devices in the first 10 weeks (Linzmayr, p. 195).

However the handwriting recognition system was also a major flaw of the product as it had mixed results with users and it was rather inaccurate. However as consumers were not pleased with the product, sales decreased and nearly stopped. Apple had managed to sell

les than 300,000 Newton devices during the next five years on the market. After 11 years after the Newton project was initiated, and after spending an estimated half-billion dollars on its development and marketing. Although the Newton was not a commercial success in the long run, it opened the way for a flood of handheld devices that followed in the later years (O’Grady, p. 48) and is believed to be a predecessor for the iPad.

The QuickTake 100, the first consumer digital camera was introduced in 1994. It worked only with the Apple Macintosh and could take between eight and 32 photos. The features that made it stand out were the built-in flash and digital display. It was not a commercial success but it opened the way for digital cameras to enter the market (O’Grady, 2009,p. 155). As Sande (2009) describes the product presentation: “Considering that digital photography for us at that time meant taking a picture with a film camera, waiting for the film to be developed and prints made, and then scanning the pictures on an expensive and slow SCSI scanner, this seemed like the future.” Three models of the product were built until the product was discontinued in 1997, after just 3 years, due to poor sales and because of the changed company policy due to the return of Steve Jobs (O’Grady, 2009,p. 156).

Apple launched the iPod a portable digital music player, in October 2001 (Yoffie, 2008, p.10). The product was developed in less than one year with a 5 GB hard drive that stored “1,000 songs in your pocket”. It was small, sleek and well-designed product priced at \$399. At the time few industry watchers were willing to bet on the product as there were already other products on the market that offered similar things. To compare: in 1998 the total digital music player sales were around \$100 million; four years later, the sales were around \$4 billion. In this market Apple held a 75% of the market with its iPod (Peterson, 2007, p. 1553).

As of October 2011, the company has sold more than 300 million iPods (Apple, 2011c). The iPod was by far outselling the Apple’s core product, the personal computer (Young, William 2005, p. 285). In the next couple of years Apple constantly updated the iPod range with new diversified products such as the iPod Shuffle, Mini, Nano, Touch and Classic (Apple Online).

Apple was one of the first companies that used user ads about their products for their own commercials during such big US events as the Super bowl. A good example of this is the iPod ad in 2007 that a student uploaded to YouTube. Apple contacted him within a couple of days and basically made an improved version of his ad, which was one of their most successful ads (Elliot, 2007).

An important thing to mention is iTunes that works hand in hand with the iPod. iTunes was announced before the unveiling of the iPod, but came to greater use when the iTunes Store was launched in April 2003. The iTunes store was started with 200,000 songs at \$0,99 each; it sold more than 50 million songs in its first year. In the coming years the iTunes Store started offering TV shows, music videos, podcasts, movies, eBooks, iTunes U and apps (Apple Online).

The iTunes Store keeps expanding at an extraordinary rate. Another innovative example of this is “iTunes U”. This is a service that allows universities to share media files among students and the general public, through a customized institution-specific version of the familiar iTunes Music Store interface (O’Grady, 2009, p. 60).

In 2005, Apple expanded their offering to digital movies, by introducing its first iPod that played movies, TV shows and music videos. In 2006 Apple introduced the Apple TV as it believed that digital video content was becoming more important. Apple introduced “an easy to use and fun way to wirelessly play all your favourite iTunes content from your Mac or PC on your widescreen TV, including movies, TV shows, music, photos and podcasts” (Apple TV Coming to Your Living Room, 2007).

Apple TV enabled users to stream movies and TV shows to a television that they previously downloaded from the iTunes Store. The product has not been as successful as the iPod as it has a high price and limited functionality that left consumers wanting more (Yoffie, 2008, p.12). Apple stated numerous times that the device was a lower priority product in Apple and is part of their “hobby program” (Yoffie, 2010, p. 12).

In January 2007 the iPhone was introduced. The product was Apple’s bid to unite the iPod with a mobile phone and as Jobs stated “reinvent the phone” (Yoffie, 2008, p.13). The product was a combination of three products (Apple website):

1. a revolutionary mobile phone,
2. a widescreen iPod with touch controls,
3. and a breakthrough Internet communications device with desktop-class email, web browsing, searching and maps.

The iPhone stood out of standard industry prices as it retailed for \$399. Other phones were usually offered to consumers at subsidized prices, but Apple questioned that strategy since they did not want their product to be undervalued (Yoffie, 2008, p. 13). The iPhone has been updated on a yearly basis and is now at its fifth version. West and Mace (2009) point out the iPhone's success was based on Apple's conception of the mobile Internet especially being “another modality of the existing wired Internet, and its leveraging of existing systems competencies”.

Additionally the iPhone has been hailed also as the best handheld game system and has around 35% of the game market for portable devices (if iPod Touch is included the market share is 75%) (Thomke, 2009).

The great reception of the iPhone has led to various efforts to copy and clone its success. Manufacturers such as Samsung, LG, Nokia, HTC, Sony Erickson and other tried to copy some of the iPhone’s features and market them as their own. With this product Apple changed the rules in the mobile phone industry as by 2008 many “iPhone Killer products were appearing on the market challenging but certainly not winning the battle” (Yoffie, 2008, p. 15).

The “iPhone Killer” name is usually used for products that are in direct competition with the iPhone and have a chance of taking some of its popularity. Apple Inc. has held an eye on them and has furthermore confronted these companies with lawsuits regarding copyright and patent infringement (Goggins, 2009, p. 243). As Apple shipped its 100 millionth iPhone in 2010, there have been no apparent “iPhone Killers” on the market as the product is still selling strong (Apple Online).

Another important part of the market that is important to mention in correlation with the iPhone is the grey market that appeared around the device. As Tim Cook said at the Apple earnings press conference in 2007: “[A] number of [iPhones] were sold to people that have an intention to unlock...our current guess is there is probably 250,000 of the 1.4 million that we sold where people had bought them with the intention of doing that” (Apple, 2007).

In July 2008 Apple introduced the iOS App store, a platform for Apple’s own applications and third party applications, which enabled users to install programs directly on their iPod or iPhone (Yoffie, 2008, p. 14). Using the iTunes user experience and interface, the app store makes it easy to be aware of, chose, pay and download applications to Apple devices (Goggins, 2009, p. 237). These applications ranged from popular games such as Scrabble, Monopoly and Angry Birds to business applications such as Citrix, Oracle and Salesforce.com (Goggins, 2009, p. 239). With this introduction Apple also paved the way for developers to develop and create apps for the iPhone and iPod Touch (Goggins, 2009, p. 239).

The App store was revolutionary mostly because of its great appeal to developer with the introduction of their Software Development Kit and the volume of consumers that could purchase apps. A month after the introduction of the software development kit, developers had already released more than 600 apps that took advantage of the iPhone device in exciting new ways, providing both monetary incentive and creative ideas to new developers (Yoffie, 2010, p.12). Today it is still the platform that is the one to be on as a company.

All applications that can be downloaded on any iOS devices need to be in accordance with their guidelines. Therefore Apple reserves the right to approve or disapprove all applications before they appear to the general public on the App Store (Yoffie, 2010, p. 11). The company also has a very controversial revenue division arrangement, as 30% of revenue from applications goes to Apple, and 70% go to the producer of the app (Goggins, 2009, p. 240). As of December 12, 2011 the iOS App store has more then half a million apps available with more than 18 billion apps downloaded by users (Apple’s Mac App Store Downloads Top 100 Million, 2011).

As mentioned above, Apple’s first tablet computer was the Newton MessagePad. Due to poor sales and obvious faults it was discontinued in 1998. On January 27, 2010 Apple’s new revolutionary tablet computer was announced, the iPad. This product is a multi-purpose mobile device for browsing the web, reading and sending email, viewing photos,

watching videos, listening to music, playing games, reading e-books and more. As described by Apple (iPad Wi-Fi + 3G Models Available in US on April 30, 2010) the tablet “allows users to connect with their apps and content in a more intimate, intuitive and fun way than ever before”. The iPad allows customers to access the iTunes Store to download audio and video files, as well as a variety of other digital content and applications. On March 2, 2011 the company introduced the iPad 2, its second-generation iPad.

The easiest way to see the impact of the iPad is to look at tablets before the iPad. Most of these devices had price tags over \$1000, worked on the Windows platform and had a stylus. Even more they accounted for only 1 % of the PC market (Yoffie, 2010, p. 12). By the end of 2010, Apple had a 75% market share in the tablet market, having sold more than 14 million iPads worldwide, while being in the market for less than one year (Isaacson, 2011, p. 203).

The current line-up of devices other than the computer is shown below in table 7. It includes Apple Tv, iPhone, iPad and four iPods. These products accounted for more than 70% of the company’s 2011 sales (Apple, 2011c, p. 30) and have brought the company to grow exponentially in the last couple of years.

Table 7: Current Product Line (non-computer)

Product	Models					
iPod Shuffle (4 th generation)	2 GB					
iPod Nano (6 th generation)	8 GB			16GB		
iPod Classic (6 th generation)	160 GB					
iPod Touch (4 th generation)	16 GB		32 GB		64 GB	
Apple TV (2 nd generation)						
iPhone (5 th generation)	16 GB			32 GB		
iPad (2 nd generation)	Wifi			Wifi+ 3G		
	16 GB	32 GB	64 GB	16 GB	32 GB	64 GB

Source: Apple Inc.

2.2.3 Software

The software on Apple computers has always been as important as the hardware and has played a vital part in the companies successful products.

QuickTime represented the beginning of video playback on computers and has become a standard feature on computers, both Mac & Windows. Apple released QuickTime 1.0 in December 1991. Quicktime was so successful that Apple produced it for the Windows Operating system in 1995. The application still exists today as Quicktime X, which is an integral part of Mac OS X (O’Grady, 2009, p. 46).

In October of 1999 Apple introduced an easy-to-use video editing application, iMovie that allowed novice users to quickly create professional quality movies (O’Grady, 2009, p. 15). In January 2001 the iDVD application was introduced providing a simple way to design customized DVDs with menus, backdrops, slideshows and home movies (Apple Brings DVD Authoring to the Desktop with iDVD and DVD Studio Pro, 2001).

Following its success with mac users, Apple introduced an application that allowed users to import, organize and perform basic edits on their digital photos, iPhoto (Apple introduces iPhoto, 2002). At the Macworld Conference and Expo on January 3, 2003 the above three applications and iTunes were bundled into the first version of iLife (Apple introduces iLife, 2003). In 2004 the fourth application, GarageBand, was added to iLife. GarageBand is an application that provides an easy way for beginner musicians to create and edit music (Apple, 2004). Two years later, iWeb was introduced as the fifth application in the iLife suite.

In 2005 Apple released iWork an office suite that included Pages, a word processor, and Keynote, a presentation software (Apple Unveils iWork ’05, 2005). iWork provided a simple userface and inexpensive office suite that was compatible with Microsoft Office (O’Grady, p. 46). In 2007 when Apple introduced its third version of iWork it also expanded it to include a third application, Numbers (Apple Introduces iWork’08, 2007). Since January 2010 all three applications have also been available on the App Store on iOS devices (Apple Launches iPad, 2010).

For the professional market Apple Inc. makes three applications: Final Cut, Aperture and Logic. Final Cut, a professional video editing software, had in 2009 a 19% market share according to the American Cinema Editors (2010). Apple also prides itself on the fact, that the software has been used to produce many successful movies in the last couple of years. Aperture, a professional photo editing software, was first released in 2005 (Apple Introduces Aperture, 2005). Logic is a digital audio workstation software application aimed a music makers and producers. Apple bought Logic, a digital audio editing software, in 2002 from a German software developer Emagic (Apple Acquires Emagic, 2002). Since then it has been a popular product in the music world.

Currently available software is shown in table 8. A great distinction can be made between the two groups of applications. Consumer applications are aimed at home use while professional applications are aimed at the professional market. Apple has also made all consumer applications available on both their platforms – Mac and iOS devices.

Table 8: Current Product Line (Software)

Consumer Applications	Pro Applications
iWork	Final Cut Pro X
iLife	Aperture
Safari	Logic
iTunes	

Source: Apple Inc.

2.3 Innovation Environment at Apple Inc.

The innovation environment at the company is crucial for this study, as it provides a complete aspect of innovation from the business side of the company. Apple is one of the world's most innovative company's according to various reports studied above. However there are two important points to make. Firstly, Apple Inc. is a very secretive company. Only employees know how the company works and how it chooses its products. Secondly Apple is not the biggest or even one of the biggest spenders on research and development. According to Jaruzelski and Dehoff (2010, p.15) Apple Inc. spends only 2.7 % of its revenue on research and development. At the D8 Conference in 2010, Jobs iterated that point by saying "Apple is a company that doesn't have the most resources. And the way we've succeeded is by choosing which horses to ride very carefully" (Paczkowski, 2010). With this statement we can deduce that Apple Inc. chooses the products it manufactures very cautiously and does not automatically use every idea that come to the table.

Even more describing is the former CEO's, Steve Jobs', words about what drives their product development (Goodell, 1994): "I have a great respect for incremental improvement, and I've done that sort of thing in my life, but I've always been attracted to the more revolutionary changes...and you usually go through a period where everybody tells you that you've completely failed."

As written above, Apple is a company that is keen on keeping secrets. It goes to great extents to keep their future products a secret from competitors, future consumers and even employees. According to Stone and Vance (2009) employees have been fired for leaking any kind of information to outsiders, and the company has even been known to spread disinformation about product plans to its own workers. Secrecy at Apple is baked into the corporate culture as can be seen in their Business Conduct Policy (p. 9) where it is stressed "One of Apple's greatest assets is information about our products and services". The document (2011, p. 9) also points out "Even within Apple, confidential information should be shared only on a need-to-know basis". Typically employees working on top-secret projects must pass through a maze of security doors, swiping their badges again and again and finally entering a numeric code to reach their offices and never being able to discuss what they are doing with their colleagues or even their managers (Stone & Vance, 2009).

Muller (2010, p. 2) emphasises that the company operates design, engineering and retailing on its own rather than licensing its products to partners. This signifies that most components of the product, from the software to the hardware, are made internally. Apple believes that it is vital to have everything made in-house to improve quality and integration with other products. In 2004 Steve Jobs expressed this by saying "You need a very product-oriented culture, even in a technology company [in order to innovate]. Lots of companies have tons of great engineers and smart people. But ultimately, there needs to be some gravitational force that pulls it all together" (Burrows, 2004, p. 1).

This approach also gives the company larger control over the products and enables it to react quicker to changing circumstances. At this point it has to be emphasised that Apple Inc. has no external focus, as it does not conduct market research and doesn't concentrate

on products by competitors (Muller, 2010, p. 4). As Vella (2008) wrote that all products launched since 1998 have focused on reducing complexity and perfecting the brands image for clean and simple design. As was in the case of the iPhone as Jobs answered in a 2008 interview: “We all had cell phones. We just hated them, they were so awful to use. The software was terrible. The hardware wasn't very good. We talked to our friends, and they all hated their cell phones too. Everybody seemed to hate his or her phones...It was a great challenge. Let's make a great phone that we fall in love with” (Morris, 2008). As is evident Apple Inc. believes that if a product is really good – everyone will want to use it.

As is apparent from different sources, Apple Inc. does not use structured methodologies for creating innovation. As Gallo (2011, p. 1) points out Apple employees do not attend innovation workshops in order to create innovative products. According to Walker (2003) Jobs is quoted as saying “We consciously think about making great products. We don't think, Let's be innovative”.

Isaacson (2011, p. 334) quotes Jobs as saying that the best innovation is “the way you organize a company” and not necessarily the way you innovate a product. Development at Apple does not follow sequential stages but happens all the time in all departments (Muller, 2010, p. 5). This is undoubtedly why Apple Inc. has created its own university, Apple University, which focuses on case studies made internally, analysing important decisions that the company has made. These cases are used to show new employees the decision-making culture that is embedded in the company (Isaacson, 2011, p. 461). Tim Cook, the current Chief executive officer, identified that Apple focuses on a few good things and says no to many things (Isaacson, 2011, p. 460). What is interesting is that Apple apparently teaches its employees how to manage situations and make decisions about products and not how innovate. According to Lashinsky (2011) “the creative process at Apple is one of constantly preparing someone - be it ones boss, ones bosses boss, or oneself for a presentation to the Chief Executive Officer”.

As written in their financial report (Apple, 2011c, p.32) Apple believes that focused investments in research and development are critical to its future growth and competitive position in the marketplace. As Jobs said at the closing keynote of the World Wide Developers Conference in 1997: “Focus is about saying, No. And the result of that focus is going to be some really great products where the total is much greater than the sum of the parts” (Popper, 2011). Cook, the current CEO, further emphasises this point by saying that Apple believes “in saying no to thousands of projects so that [they] can really focus on the few that are truly important and meaningful to [them]. [They] believe in deep collaboration and cross-pollination of [their] groups, which allows us to innovate in a way that others cannot” (Elliot & William, 2011, p. 226).

As Jaruzelski and Dehoff (2010, p.12) point out Apple spends less than half the average percentage in revenue on research and development than other computer and electronics companies do. The authors go on to say that the company is a great example of where success in innovation is not determined by how much you spend but rather how you spend.

As Trott (2005, p. 78) suggests that creative people are attracted to companies that themselves are viewed as creative. Consequently Apple has a remarkable reputation of being innovative and creative. The company is also aimed at hiring people who are passionate about its products. An Apple employee is never satisfied with a product but is rather fanatic about every single detail and inspires to make it better (Morris, 2008). Apple also pays its key employees up to 50% more than competitors. Whereas Jobs, the previous Chief Executive Officer, believed that the major benefit Apple offers to its employees is the change to work at the coolest company on earth and produce the world's best products (Muller, 2010, p. 6).

Furthermore it is important to point out the subculture that the company has created. Apple has one of the most loyal, dedicated and faithful consumer bases in the world (O'Grady, 2009, p. 39). The annual MacWorld Expo conference always started with a keynote presentation from Jobs. Tickets were very difficult to get and the experience was more similar to a rock concert than a technology presentation (O'Grady, 2009, p. 39). Apple consumers are known to wait in line to wait and be one of the first buyers of a new product or service.

To summarize the company's innovation environment is very closed. The company operates design, engineering and retailing on its own in order to create a great product. However it is also obvious that Apple is distinguished from its competitors by the ruthless emphasis on secrecy. Furthermore Apple has no predetermined process to foster innovation. All energy is dedicated to making great products.

2.4 Models of Innovation at Apple Inc.

During its history the company has used different models of innovation. As will be shown the company used the two linear models of innovation. It is important to point out that the company, which is characterized as the most innovative company in the world, is transforming from an open innovation model to a closed one, while most are working toward the opposite.

The Technology Push was being used at the beginning of the company's arrival to the market. As is stressed above one of the founders Steve Wozniak, found a technology, that Steve Jobs though would be marketable and they started selling the Apple I while at the same time showing customers how to modify the system to their needs. This is typical for the technology push model as it is presumed that first researchers make unexpected discoveries and these are then turned into products (O'Grady, 2009, p. 69).

When it comes to innovation models, Burrows (2004) argues that it is essential to focus both on the market-pull and technology push approach. Apple however solely concentrates on the technology push approach and entirely relies on its intuition and perfectionism. Apple believes that consumers don't know what they want, so the company has to tell them what to buy (Muller, 2011, p. 3). Products that followed this model include the Apple I, QuickTake and most of the company's current products.

An example of the market pull approach is with the Apple II. The company saw potential from the market to build a computer that consumers would like buy and had features that consumers wanted. With this research the company produced a computer that was a great success and followed towards the market pull model of innovation.

As presented throughout the company's history, Apple has tried to remain a top IT company with the technology push approach. This was shown in the previous chapter where it was shown that the company does not do any market research and rather relies on instincts when creating new products. This will also be further discussed in the next chapter, where the analysis will focus on new technologies that were introduced in products.

While most companies are levitating toward the open innovation model, as it is emphasises the "wisdom of the crowds" and "more people know more", Apple has been doing quite the opposite for the last ten years.

If we look back at the beginning of the company Apple used the open model of innovation, as it let users of the Apple II change code and believed everything needed to be open-source (Cruikshank, 2006, p.29). Later on while working on the LaserWriter printer the company connected with Adobe Systems, where they believed that they could work together better (O'Grady, 2009, p. 45). Again for this product, as for the QuickTime camera, they cooperated with Kodak (O'Grady, 2009, p. 46), Apple worked within the Open model of innovation.

Apple still used the Open model of innovation when entering the portable mp3 market. Apple introduced the iPod and then quite quickly made a special iPod for HP, then they joined forces with Nike to create Nike+ and thirdly it joined with Motorola for an iPod mobile phone- Moto Rokr (Cruikshank, 2006, p. i).

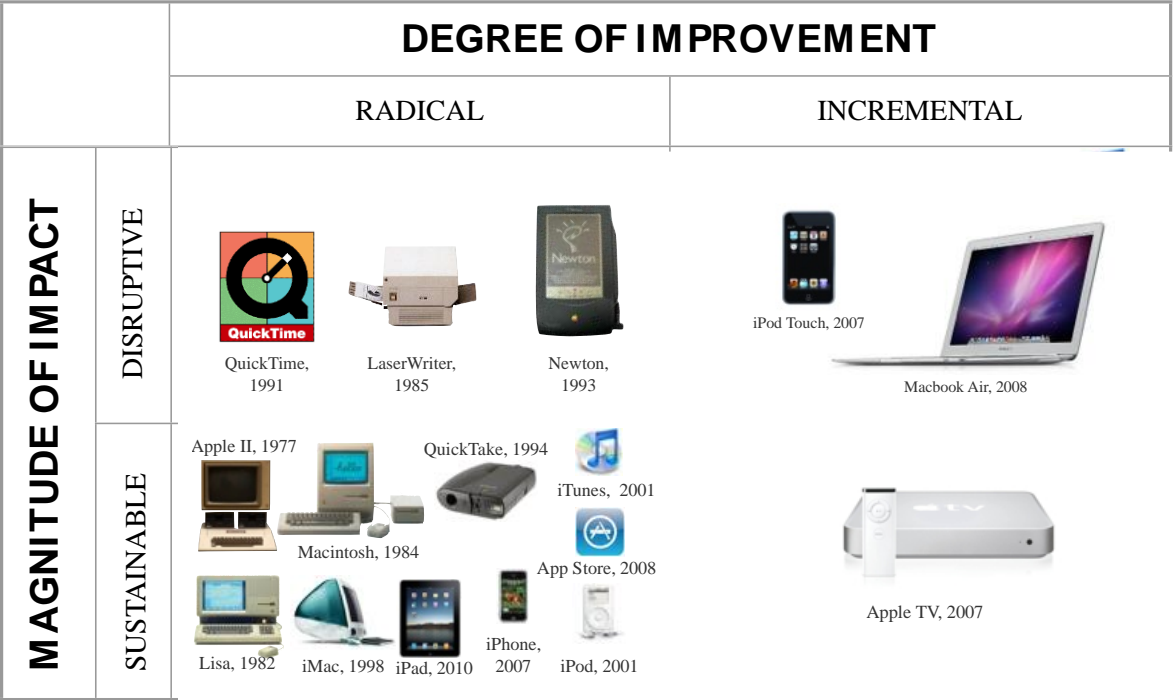
Lately Apple has maintained an even more closed innovation model. A great example of this is their App store. All applications that can be downloaded on any iOS devices (iPhone, iPad, iPhone) need to be in accordance with their guidelines. Therefore Apple reserves the right to approve or disapprove all applications before they appear to the general public on the App Store (Yoffie, 2010, p. 11).

The company is therefore responsible for everything from the software, design, marketing, manufacturing, distribution and stores.

3 INNOVATION CLASSIFICATION OF APPLE PRODUCTS

Following the methodology outlined in chapter 2.1, innovations were classified into the following quadrants. The figure below represents the degree of improvement versus the magnitude of impact including the products (selected by the author) and their release dates.

Figure 9: The degree of improvement versus magnitude of impact including Apple products and their release dates



Source for images: <http://www.apple.com>

3.1 Quadrant 1: Radical Disruptive Innovation

The first quadrant characterizes radical disruptive innovations. This quadrant will therefore include products that involve a totally new technology and at the same time created a dramatic change and customarily create new markets. Products in this quadrant represent something new in the world and at the same time are simpler, smaller and easier to use than anything before. Additionally these products do not tackle demand but rather create a demand that is unrecognized by the consumer. The respondents placed three of the company’s products into this category: LaserWriter, Newton and QuickTime, as all of these products were comprised of a new technology and shaped a new market.

Apple had a great impact on the printing market with its LaserWriter, which was the first laser printer that could print both font and images and moreover be used by everyone (network printing). As Edwards (2010) explains “the launch of the LaserWriter effectively marked the beginning of the desktop publishing era—that era in which anyone could design and print professional looking publications with their PC.” This created a demand that was previously unidentified by consumers. Due to the fact that this product presented consumers with a totally new technology while at the same time opening a new product category and market. Both respondents placed this product in the first quadrant.

The first portable product that distinctly fits into this quadrant is the personal digital assistant Newton. As written above this product relied heavily on unproven sensor screen technology and created a new market for the consumer, which is still very attractive today as it has lately become a phenomenon of its own. The product was ahead of its time and

presented the consumer with new technology that had not been previously seen. It featured the touch screen display, the PC Card slot and the stylus (O'Grady, p. 49).

Another new technology that was presented to the consumer was the handwriting recognition system. This system adapted to the user and could be trained to understand an individual's handwriting style. This was a first time the handwriting recognition software was introduced to the consumer base and became very successful- selling 50,000 devices in the first 10 weeks (Linzmayr, p. 195). As described above this product presented the consumer with a new technology and opened a totally new, now called, tablet market. As both respondents pointed out the Tablet market is gaining more momentum and is becoming even more popular today. Furthermore they both believed that this is one of the first products that opened the product category and was a predecessor to today's iPad.

Apple introduced the software QuickTime in 1991. This product represented the beginning of video playing on computers and has since then become a standard feature on all computers (O'Grady, 102). With this software Apple Inc. created a totally new technology and at the same time brought something to market that no consumer knew was needed. The software is still available for the Mac and Windows environment and plays a prominent role in watching movies. The market for video players on the computer grew exponentially from that moment on with competitive products coming from all of Apple's software competitors. The respondents both agreed with this classification.

These three product can all be viewed as items that were the first to market with such a technology and did not only present consumers with only a new product but also started a new market within the IT industry. None of these products were successful at the time they were presented. But more then ten years later, they all seem to have been vital in the development of today's commonly used products. The LaserWriter was one of the pioneers in delivering printers to homes; the Newton Message Pad was the pioneer of tablets today; and QuickTime is still used today for viewing digital content on computers.

3.2 Quadrant 2: Incremental Disruptive Innovation

The second quadrant describes innovations that offer a completely old technology to a new market. The product addresses the next generation needs of consumers while at the same time creating a demand that was before unrecognized by the consumer. Additionally with the fresh technology the product changes the existing market so thoroughly that competitors have to play catch-up in order to regain their part of the market.

The respondents placed two products into this category because both products feature element improvements of already existing products within the company. These improvements were however so large that they represented an innovation in themselves. These two products are the iPod Touch and the Macbook Air.

Building on the success of the iPod and the iPhone, Apple built the iPod Touch. In short it is essentially an iPhone without a phone. The iPod Touch had all the features of the iPhone expect a binding contract with a mobile phone operator. It was the first iPod with a WI-FI connection and offered "over-the-air" purchases from the iTunes and App Store. This

product introduced a feature improvement of the previous iPod models and implemented technology from the iPhone. However the iPod Touch created a dramatic change in the MP3 market as it actually attacked the portable gaming market even more than the expensive iPhone. With this move it exploded in the portable gaming market and made game developers excited about the possibility of the touch screen in connection with a new gaming experience. It became a hit mainly because it was the cheapest way to get to the App Store. In less than two years the company sold more than 45.2 million units of the iPod Touch which became the best selling iPod (Apple Launches iPad, 2010). According to Apple the iPod Touch is the number one handheld gaming device in world, outselling game devices from Sony and Nintendo- combined (Hollister, 2010).

The Macbook air was a revolutionary product not just due to its tiny size and full feature set but because it created a new category of notebook, an ultraportable.

3.3 Quadrant 3: Radical Sustainable Innovation

The radical sustainable innovations quadrant includes products that include a new technology in an existing market. The product addresses the next generation needs of consumers while at the same time creating a demand that was before unrecognized by the consumer. Furthermore the new product changes the existing market so thoroughly that competitors have to play catch-up in order to regain their part of the market.

The respondents placed most of the company's chosen products into this category. The products placed were the Apple II, Lisa, Macintosh, QuickTake, iMac, iPod, iPhone, App Store and iTunes and the iPad as all of these products comprised of a new technology and entering a market that already existed but transforming it immensely.

The Apple II is the first product from the company that can be placed in this category. The Apple II was one of the first highly mass-produced computers and first computer ever delivered in a plastic box (Cruikshank, p. 30). Not only that but O'Grady (2009, p. 1) acknowledged that this product put the concept of personal computers into the awareness of the average consumer. The product had a built in keyboard and colour screen (O'Grady, 2009 p. 6), which was a total novelty at the time, where computers were not yet consumer products but rather intended for hobbyists. Both respondents agreed that this computer was not the first computer to market, however it introduced certain new technology that completely changed the market.

Lisa was packed with industry firsts, including a pointing device, a graphical user interface, drop-down menus, windows, multitasking, a hierarchical file system, copy and paste, icons and folders. Not all of these things are Apple's inventions, they just made them available to consumers and showed users how these features work and how they can simplify processes (Gallo, 2009, p. 30-31). The Lisa was not the first product to this market but it introduced a great number of new technologies in a new way and it transformed the computer market. This is why both respondents and the author believe it should be placed in this category.

The Macintosh was the first personal computer that mainstreamed the mouse input device as we use today, an easy-to-use graphical user interface and a 9-inch display (O'Grady, 2009, p. 10). It was introduced at a time where there was already intense competition in the personal computer market. The new mouse input device was the primary reason this product was innovative as all competitors had to play catch-up (Isaacson, 2011, p. 100). The respondents agree that the new technology in this product transformed the computer market and created a product that generated demand.

The QuickTake 100 was the first consumer digital camera that featured built-in flash and digital display. This product was one of the pioneers in the camera market and transformed it into the digital camera market that we know today. It paved the way for most products available today due to the new technology introduced.

The iMac is the next products the respondents placed in this category, as it offered new technology to an existing marketplace. The iMac was a low-end consumer friendly computer, which made the Internet look easy. The new technology that the iMac introduced is the ease of use of computers. The product was mainly advertised by the product being the easiest computer to connect to the internet while at the same time showing consumers how easy it was to upload photos and movies, edit them and send them to friends. The iMac was appealing to people, who were already using computers and also to people who previously found computers unattractive. The product therefore expanded the market and made the new technologies introduced an absolute must for competitors.

The first digital music players were introduced to the market in 1998. Apple released the iPod in 2001. Apple offered an MP3 player with an easy-to-use menu, click wheel and a great amount of space and as the iTunes software. The integration between the hardware and the software provided consumers with a simple solution to an existing problem- the computer served as a hub, as it allowed the portable device to be simple.

The iPod was therefore innovative due to a combination of points. The fact that the device could fit into your pocket and was very portable was one of its main reasons for success. Secondly the iPod's spacious 5 GB hard drive could hold 1000 songs. Thirdly the interface is so simple and intuitive to use, that most people can pick one up and master the basic within a few minutes. Consequently the integration between the iPod mp3 player, iTunes software and the iTunes online music store, Apple was in the position to control the complete user experience from beginning to end.

Both experts believed that an important fact to mention is that this was the first Mp3 player that became a fashion accessory with its iconic white ear buds which were a must have for anyone wanting to be a "hip technophile". The iPod became popular due to the status symbol it showed (O'Grady, 2009, p. 6). Furthermore according to O'Grady (2009, p. 59) many users that were introduced to the iPod switched to the Mac platform as a result of their experience with the iPod.

Another revolutionary device by Apple is the iPhone. It was hailed as the invention of the Year by Time magazine in 2008 (Yoffie, p. 9). According to Vogelstein (2009) the iPhone “blew up the wireless industry” since it unlocked a host of benefits for consumer, developers, manufacturers and carriers. Apparently the company had invested \$150 million dollars and two and a half years of development efforts in order to reinvent the phone (Yoffie, p. 10). As Hamblen (2008) explains no cell phone has ever generated so much interest so quickly.

The iPhone changed the rules in the mobile phone market. Both respondents agree that the biggest innovation was the 3,5 inch liquid crystal display with a scratch resistant touch screen made from gorilla glass. The phone had no physical keyboard therefore it is controlled through touches and gestures and it redefined “easy to use” in the cell phone industry according to Hamblen (2008). According to Heller (2011) the iPhone led the smartphone revolution due to its touch screen, software and iconic design.

The iPhone transformed the mobile phone market from every point of view. It generated demand from different types of users as all of them saw a different advantage by having the iPhone. The touch screen is now a compulsory feature of new trendy phones due to consumer demand.

As mentioned above the software that works hand in hand with the iPod, iPhone and iPad and has played a great part in the success of these products is iTunes. It is important to distinguish between iTunes, a proprietary digital media player application and the iTunes Music Store, a software-based online digital media store. As Yoffie (2010, p. 11) writes online music retailers did exist in 2003 but all of them were based on subscription services, which means they were charging a monthly fee and allowing users to access their catalogue of music. iTunes functions under a distinctive pricing model, it is an à-la-carte MP3 store, where individual songs can be purchased all at the same price. This was a totally new way of doing things, which was not used before.

Furthermore iTunes can be seen as a marketing and process innovation as Apple turned the way music was sold upside down. When it opened Apple signed deals with five major record labels at the time- EMI, Sony Music Entertainment, BMG, Warner and Universal, this meant that most of the popular music at the time was on the iTunes Music Store (Isaacson, 2011, p. 300). In the first year more than 100 million songs were sold through iTunes (O’Grady, 2009, p. 61) and has since become the biggest music seller in the USA (Apple Launches iPad, 2010).

Both the Mac and iOS App store are an important part of the iTunes phenomenon. The iOS App Store, introduced in July 2008, provided Apple with a platform for their own applications and third party applications (Yoffie, 2008, p. 14). With this introduction Apple Inc. also paved the way for developers to develop and create apps for the iPhone and iPod Touch (Goggins, 2009, p. 239). The App store was revolutionary mostly because of its great appeal to developer with the introduction of their Software Development Kit and the volume of consumers that could purchase apps. A month after the introduction of the

software development kit, developers had already released more than 600 apps that took advantage of the iPhone device in exciting new ways, providing both monetary incentive and creative ideas to new developers (Yoffie, 2010, p.12)..

The iPad has been hailed from different sides as a great innovation. It has been a revolutionary device and changed the way many people read books and magazines. It has been also hailed from different industries. For example Hager (2010) and Barry (2011) wrote about how the device is great for children with disabilities; Broda-Bahm (2011) discussed how to use the iPad in a courtroom; Stanford medical school has also introduced the iPads to all student hoping to solve the problem with overwhelming amount of information facing medical students, and all doctors” (White, 2010). They hope that the iPad may be able to help users access that pool of knowledge. Different airline companies announced in May 2011 that the iPad would be replacing 40 pounds of flight manuals for pilots (Murphy, 2011).

It therefore transformed a market that existed but where consumers did not know what to use tablets for. Now tablets are the thing to use in consumers personal and work environments. As mentioned above Apple is now involved in numerous court cases involving protecting their patents against their biggest competitors such as Samsung and HTC, as most of them copied their product innovations and used them to lure consumers. The product introduced a new technology to an existing market, making the market interesting to consumers on a wholly different level.

3.4 Quadrant 4: Incremental Sustainable Innovation

The quadrant *incremental sustainable* innovations describes products that are not technologically challenging however still address the next generation needs of consumers in the mainstream market that consumers already value. This product can concentrate on cost or feature improvements and create higher profit margins for the company. This product can also improve competitiveness with the current market. The respondents believed that only one of the chosen products fit into this category- Apple TV. The product does not represent a new technology not does it open a new market, however due to its user interface it provides the consumers with a product that helps them complete the Apple experience at home.

The product transfers media files seamlessly from any Apple device in your house to your television. The Apple TV experience is so great also because of the integration with iTunes. Since 2007 iTunes users had the possibility to download and rent movies, TV shows and podcasts directly through the Internet to your television. By the October 2008, Apple had sold more than 200 million television episodes and 2 million films (iTunes Tops 200 Million TV Episodes Sold, Including Over One Million HD Episodes, 2008). This product features technology that was already introduced on the iPod and iPhone but introduced it in a market where competitors did not exactly know how to distribute content to consumer televisions.

Since the beginning Apple has been keen to point that Apple TV is a hobby project for them. However the success of the product has been high in comparison with competitors and low in comparison with other of Apple's innovations. By December 2009 six million Apple TV's were sold, when a newer version arrived in September of 2010, one million additional units were sold in less than three months (Isaacson, 2011, p. 420-425).

3.5 Findings

The first point to make is that the products studied are from different times in the history of the company. This plays an important role in the findings as products from the same time are usually placed in the same quadrant. For example the products from the early years of the company were placed in the radical disruptive innovations quadrant. This quadrant has products that feature a new technology and formulate a new market. What we can deduce from this finding is that Apple's earliest innovations featured new technology and were aimed at producing a new market place. Therefore the company at that time was aimed at creating new product that consumers did not yet know and make them mainstream and necessary in everyday life.

Most of products known today were placed in the incremental disruptive innovation quadrant. This signifies that most of the innovative products studied were technologically advanced but were introduced in an existing market. This can indicate that the company believes that they do not need to create a new market to be innovative but instead improve a product that is already known to consumers in such a way that it is looked upon as a new product. A worthy example of this is the iPod, where there were many digital music players on the market, but as soon as the iPod was introduced it was the only digital music player that represented the market and had most of the market share.

Furthermore the fact that the company directs its attention at existing markets shows that it believes that many products can be improved greatly. A valid example is the iPhone as Jobs pointed out, the company created the product because all of their employees were disappointed by the usability, quality and design of the products available in the market (Morris, 2008) and believed they could create great product.

This example also shows how Apple focuses internally instead of externally for product ideas. According to the company no external marketing research is done in order to see how to satisfy consumer demand instead the company knows its consumers to the point where they direct consumer demand and change it as they improve products, which were previously at a standpoint. Instead products need to show consumers what they offer and stimulate the consumer's desire to buy it . Furthermore it iterates the point made above that the company uses the technology-push approach, as it wants to ensure the products developed are innovative and meet consumer needs.

The LaserWriter and Newton were both placed in the radical disruptive innovations quadrant. Neither gained commercial success but paved the way for commercially very successful products. Both of these products opened a category that is still very attractive

today and is an integral part of most people's lives. From this it can be acknowledged that products from the company that are radical and disruptive are rarely commercially successful as this is a new category, where consumers do not yet exactly know what they want from a product. Looking at the company's products it is evident that more commercially successful products such as the iPod and iPhone are usually placed in the incremental disruptive innovation quadrant.

The third quadrant, which includes the iPod Touch and Macbook Air shows us that the company does not give up on products once they are introduced but rather keeps on reinventing them and sometimes comes across a new innovation altogether. This was the case with both of the above products. These products both launched new markets and shocked the associated markets with their uses.

The incremental sustainable innovation quadrant, which features the Apple TV can be characterized as containing innovations that are neither new technologically nor to the market but are still viewed as innovations. What made the Apple TV an innovation is the way the company presented it. This is where marketing innovation also came into the mix, as it was a crucial piece of having the whole Apple experience at home. What can be learned from this product category is that Apple calls this its "hobby program" as it does not know how the product is going to be seen in the market. From this we can deduce that products in this category are not usually seen as an innovation but rather just an enhancement of a previous product.

The findings also indicate that a great part of innovation is played by the integration between these devices, a innovation ecosystem. If the iTunes music store didn't exist, the iPhone, iPod, iPad, Mac nor Apple Tv would not have the success they have today. The integration aspect of these products can therefore represent a crucial portion of the products' success. From the point of the consumer, the integration and usability of all these devices together makes it an integral part of their lives.

The company also tries to find an area where consumers are not satisfied with supply. A great example is the above mentioned iTunes music Store. Before this the digital music market was a mess with many different services offering music free of charge on torrent networks. Apple changed all this because it fought hard against the conventional music-publishing model and rather tried to establish a new model, which would be a compromise between music labels and widespread piracy. If the music was too expensive consumers would still pirate music. A great side effect was also that many artists can now release self-produced albums on iTunes and have all the profits from their music.

Even the App Store is a great example of this. Before it was introduced there were only a handful of applications that were available on consumer phones and if applications did exist they were expensive. Therefore application purchases were few and far unless essential. With the App Store Apple encouraged developers to price their software reasonably in order to have more consumers. Priced at a fragment of the price of computer applications, apps have been bought by everyone who owns an iPod, iPhone or iPad.

It can be concluded that Apple is concentrated on bringing new technologies to already established markets. The findings show that Apple is very product oriented believing that it is better to choose a constricted number of products rather than having many with not as much innovation.

Regarding the quadrant analysis, the analysis shows, that it is possible to allocate innovations into one of the defined quadrants. Furthermore it has been shown that it is possible to categorize innovations by 4 simple definitions: radical, disruptive, incremental and sustainable. It is also evident that an innovative company, such as the one analysed, can divide their innovative products in to the quadrant above and deduce what innovations they should concentrate on in the future.

CONCLUSION

The subject of innovation types has been broadly studied and many authors have contributed to its development, as shown above. However most studies about innovation are vague and contradictory, that is why this topic was chosen to try to create distinctive definitions of different types and classifications of innovation. As shown four specific terms were chosen and used to try to better define innovations. This was done by studying the different interpretations of the terms associated with innovation and then merging them to make categories. These categories were created to accommodate all innovations not just product innovations and were demonstrated on an IT company.

This thesis contributes to the theory of innovation by examining the world's most innovative company, Apple Inc., and considering what we can learn from it. Firstly, this thesis contributes to theory by introducing the innovation types and classifications of innovation. Distinctly describing the different classifications of innovations was needed in order to accordingly dividing the IT Company's products among these classifications. The products were assorted by the magnitude of impact of the innovation and the degree of improvement. The company also tries to find an area where consumers are not satisfied with supply and try to establish a new model for consumers.

After studying about Apple Inc. some important deductions in connection with innovation must be stated. While most companies are levitating toward the open innovation model, as it emphasises the "wisdom of the crowds" and "more people know more", Apple has been doing quite the opposite for the last ten years. The company operates design, engineering and retailing on its own rather than licensing its products to partners. This approach also gives the company larger control over the products and enables it to react quicker to changing circumstances.

Furthermore Apple spends little of its earnings on specifically research and development. Which brings up a question about how to define the research and development team in a company similar to Apple Inc., where all employees are essentially involved in the development of a product. As is apparent the company does not believe in structured

methodologies for creating innovation. This brings up a possibility for further research in the area of innovation creation and if there is a way to define how successful a product will be before it is launched.

The most important deductions from the quadrant analysis were that products from the same time were usually placed in the same quadrant. The company's current products were most commonly placed in the incremental disruptive quadrant. This indicates that the company mostly improves products that are already known to consumers in such a way that it is looked upon as a new product. Products from the case study that are radical and disruptive were not commercially successful because the product represents a new category, where consumers do not yet exactly know what they want from a product. The company's most successful products were placed in the incremental disruptive quadrant. All the allotted products introduced a new technology to an existing market, making the market interesting to consumers on a wholly different level and bringing a bigger base of consumers to the market. The case shows that products in the third quadrants are associated to previous innovations. These products were descendants of other products. The company keeps on reinventing products that have already been introduced and comes across a new innovation altogether. This was the case with both of the products in the third quadrant. These products both launched new markets. The potential of innovations in the fourth quadrant of innovation cannot be analysed with the case used, as there was only one example found. Other companies' case studies could help in this respect.

Overall, the quadrant analysis shows, that it is possible to allocate innovations into one of the pre-defined quadrants. Additionally it is shown that it is possible to categorize innovations by 4 simple definitions: radical, disruptive, incremental and sustainable. It is also evident that an innovative company, such as the one analysed, can divide their innovative products in to the quadrant above and deduce what innovations they should concentrate on in the future. Following the analysis and findings it can be stated with that product innovations can be divided into the quadrants.

The thesis has some limitations and opportunities for further research. A limitation of the company chosen for the case study was the amount of primary source information available as it is a very secretive company. Only employees know how the company works and how it chooses its innovations.

The analysis of innovations could be conducted on a wider scale, which could contribute to better evaluation of the quadrant. Furthermore the distinction between process, marketing and organization innovations could be considered in the analysis and would contribute to classification of innovations. This could have been done if more than one case study was done. Case studies in other settings such as other industries, multinational corporations and other establishments are needed to further validate the use of the quadrant. A more detailed study of the how to measure innovativeness within a company would also have been valuable. However the purpose of this thesis was to gain a better understanding of the term and classifications of innovation in connection with Apple Inc. This thesis therefore opened a new area of study that would further enhance our understanding of innovation.

REFERENCE LIST

1. *2009 ACE Equipment Survey* (July 7, 2010). Retrieved November 19, 2011 from <http://ace-filmeditors.blogspot.com/2010/07/2009-ace-equipment-survey.html>
2. *800,000 iMacs Sold in First 139 Days* (1999, January 5). Retrieved December 16, 2011 from http://www.apple.com/ca/press/1999/01/iMac_Sales.html
3. Ahuja, G. & Lampert, M. (2001). Entrepreneurship in the large corporation: A longitudinal study of how established firms create breakthrough inventions. *Strategic Management Journal*, 22, 521–543.
4. Andrew, J., Manget J, Michael C. D., Taylor A. & Zablit, H. (April, 2010). *Innovation 2010: A Return to Prominence and the Emergence of a New World Order*. Boston: The Boston Consulting Group.
5. Andrew J., DeRocco S. E., Taylor A. (2009). *Innovation imperative in manufacturing: How the U.S. can restore its edge*. Boston: Boston Consulting Group.
6. Apple (2011, October 10). *Quarterly results for Q4, 2011*. Retrieved December 2 from <http://files.shareholder.com/downloads/AAPL/1550220127x0xS1193125-11-282113/320193/filing.pdf>
7. Apple (2012). Business Conduct Policy. Retrieved February 7, 2012 from http://files.shareholder.com/downloads/AAPL/1635337056x0x443008/5f38b1e6-2f9c-4518-b691-13a29ac90501/business_conduct_policy.pdf
8. *Apple Acquires Emagic* (2002, July 1). Retrieved December 1, 2011 from <http://www.apple.com/pr/library/2002/07/01Apple-Acquires-Emagic.html>
9. *Apple Brings DVD Authoring to the Desktop with iDVD and DVD Studio Pro* (2001, January 9). Retrieved November 12, 2011 from <http://www.apple.com/pr/library/2001/01/09Apple-Brings-DVD-Authoring-to-the-Desktop-with-iDVD-and-DVD-Studio-Pro.html>
10. *Apple Fourth Quarter Press Conference Video* (2007, October 22). Retrieved July 15, 2011 from <http://www.apple.com/quicktime/qtv/earningsq407/>
11. *Apple Introduces Aperture* (2005, October 19). Retrieved November 11, 2011 from <http://www.apple.com/pr/library/2005/10/19Apple-Introduces-Aperture.html>
12. *Apple introduces iLife* (2003, January 7). Retrieved November 12, 2011 from <http://www.apple.com/pr/library/2003/01/07Apple-Introduces-iLife.html>
13. *Apple introduces iPhoto* (2002, January 7). Retrieved November 11, 2011 from <http://www.apple.com/pr/library/2002/01/07Apple-Introduces-iPhoto.html>
14. *Apple Introduces iWork'08* (2007, August 7). Retrieved October 7, 2011 from <http://www.apple.com/pr/library/2007/08/07Apple-Introduces-iWork-08.html>
15. *Apple Introduces MacBook Air—The World's Thinnest Notebook* (2008, January 15). Retrieved November 11, 2011 from <http://www.apple.com/pr/library/2008/01/15Apple-Introduces-MacBook-Air-The-Worlds-Thinnest-Notebook.html>
16. *Apple Launches iPad* (2010, December 12). Retrieved October 8, 2011 from <http://www.apple.com/pr/library/2010/01/27Apple-Launches-iPad.html>
17. *Apple's Mac App Store Downloads Top 100 Million* (2011, December 12). Retrieved December 16, 2011, from

- <http://www.apple.com/pr/library/2011/12/12Apples-Mac-App-Store-Downloads-Top-100-Million.html>
18. *Apple TV Coming to Your Living Room* (2007, January 9). Retrieved October 7, 2011 from <http://www.apple.com/pr/library/2007/01/09Apple-TV-Coming-to-Your-Living-Room.html>
 19. *Apple Unveils iWork '05* (2005, January 11). Retrieved November 11, 2011 from <http://www.apple.com/pr/library/2005/01/11Apple-Unveils-iWork-05.html>
 20. Barry, E. (2011, June 29). *iPad becomes the Apple of Holly's eye*. Retrieved October 11, 2011 from <http://www.heraldsun.com.au/news/more-news/ipad-becomes-the-apple-of-hollys-eye/story-fn7x8me2-1226083773188>
 21. Briggs, H. (2012, January 18). *The Innovation Obsession*. Retrieved March 8, 2012 from <http://www.innovationmanagement.se/2012/01/18/the-innovation-obsession/>
 22. Broda-Bahm, K. (2011, March). A Video Review of the 'iJuror' and 'Jury Duty' Apps. *American Society of Trail Consultants*, 23(2).
 23. Burrows, P. (2004, October 12). *The Seed of Apple's Innovation*. Retrieved December 12, 2011 from http://www.businessweek.com/bwdaily/dnflash/oct2004/nf20041012_4018_db083.htm
 24. Chen, Y. (2006). Marketing Innovation. *Journal of Economics & Management Strategy*, 15, 101–123.
 25. Chesbrough, W. H. (2003). The Era of Open Innovation. *MIT Sloan Management Review*, 44(3), p. 35-41.
 26. Christensen, M. Cs. (1997). *The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail*. Boston: Harvard Business School Press.
 27. Christensen M. C, Overdorf M. (2000). Meeting the Challenge of Disruptive Change. *Harvard Business Review*, 78; 66-77.
 28. Commission of the European Communities (2006). *Putting knowledge into practice: A broad-based innovation strategy for the EU*. Brussels: Office for Official Publications of the European Communities.
 29. *Connect and Develop, Proctor and Gamble*. Retrieved January 7, 2012 from https://secure3.verticali.net/pg-connection-portal/ctx/noauth/0_0_1_4_83_4_3.do
 30. Cruikshank, L. J. (2006). *The Apple Way: 12 Management Lessons from the worlds most Innovative Company*. New York: McGraw-Hill
 31. Daft, R. L. (1978). A dual-core model of organizational innovation. *Academy of Management Journal*, 21, 193–210.
 32. Damanpour F., Walker R. M. & Acellaneda C. N. (2009). Combinative Effects of Innovation Types and Organizational Performance: A Longitudinal Study of Service Organizations. *Journal of Management Studies*, 46(4), p. 650-675.
 33. Davenport, H. T. (1992). *Process Innovation: reengineering work through information technology*. Boston: Harvard Business Press.
 34. Davenport H. T., Leibold M. & Voelpel S. (2006). *Strategic Management in the Innovation Economy*. New York: Wiley.
 35. Don't laugh at gilded butterflies (2004, April 22). Retrieved March 10, 2011, from <http://www.economist.com/node/2610485>

36. Drucker, P. F. (1998). The discipline of innovation. *Harvard Business Review*, 76(6), 149–157.
37. Edquist, C. (1997). Systems of innovation approaches their emergence and characteristics. In: C. *Systems of Innovation Technologies, Institutions and Organisations* (pp. 1–35). London: Pinter. From The International Handbook on Innovation.
38. Edwards, B. (2010, April 27). *Four reasons the LaserWriter mattered*. Retrieved December 10, 2011 from <http://www.macworld.com/article/150845/2010/04/laserwriter.html>
39. Eisenhardt, M. K. (1989). Building Theories from Case Study Research. *The Academy of Management Review*, 14(4), 532-550.
40. Elliot, S. (2007, October 25). *Student's Ad Gets a Remake, and Makes the Big Time*. Retrieved January 10, 2011 from http://www.nytimes.com/2007/10/25/business/media/26apple-web.html?_r=3&ref=business&oref=slogin&oref=slogin&oref=slogins
41. Elliot, J., William & L. S. (2011). *The Steve Jobs Way: iLeadership for a New Generation*. New York: Vanguard Press.
42. *European Commission* (n.d.). What is innovation. Retrieved March 10, 2011, from http://ec.europa.eu/enterprise/policies/innovation/faq/index_en.htm
43. Garcia, R. & Calantone R. (2002). A critical look at technological innovation typology and innovativeness terminology: a literature review. *The Journal of Product Innovation Management*, 19, 110—132.
44. Gilbert, J. T. (1994). Choosing an innovation strategy: Theory and practice. *Business Horizons*, 37(6), 16.
45. Goggins, G. (2009, April) Adapting the mobile phone. The iPhone and its consumption. *Continuum: Journal of Media and Cultural Studies*, 23(2), 231-244.
46. Goodell, J. (1996, April). The rise and fall of Apple Inc. *Rolling Stone*, 732, 51-53.
47. Goodell, J. (1994, June). Steve Jobs in 1994: The Rolling Stone Interview. *Rolling Stone*, 683, 73-79.
48. Hage J. & Meeus M. (2006). *Innovation, Science, and Institutional Change*. Oxford: Oxford University Press.
49. Hager B. E. (2010, October 29). *iPad Opens World to a Disabled Boy*. Retrieved October 11, 2011, from <http://www.nytimes.com/2010/10/31/nyregion/31owen.html?scp=1&sq=ipad%20disabilities&st=cse>
50. Hamblen, M. (2008, June 3). *iPhone: One year later*. Retrieved November 11, 2011, from <http://www.macworld.co.uk/ipad-iphone/news/index.cfm?newsid=21525>
51. Heller, S. (2011, October 10). Design Different. Retrieved December 16, 2011 from <http://www.thedailybeast.com/newsweek/2011/10/09/design-different.html>
52. Hitt M. A., Ireland D. R. & Hoskisson E. H. (2007). *Strategic Management: Competitiveness and Globalization (Concepts and Cases)*. Mason: Thomson South-Western.

53. Hof. D. R., Depke A. D. Levine B. J. & Schwartz I. E (1991). An Alliance made in PC heaven. *BusinessWeek*, June 24, 1991. Retrieved May 9, 2011, from <http://www.businessweek.com/archives/1991/b321914.arc.htm>
54. Hollister, S. (2010, September 1). *Apple claims 50 percent of portable gaming market, iPod touch outsells Nintendo and Sony combined*. Retrieved December 15, 2011 from <http://www.engadget.com/2010/09/01/apple-claims-50-percent-of-portable-gaming-market-ipod-touch-o/>
55. Hornby T. (2005). *Low End Mac*. Retrieved May 9, 2011, from <http://lowendmac.com/orchard/05/powerbook-origin-1991.html>
56. Inovate. (n.d.). In *Online Etymology Dictionary*. Retrieved March 10, 2011, from <http://www.etymonline.com/index.php?term=innovate>
57. *Insead*. Global Innovation Index 2009/2010 report. Retrieved April 8, 2011, from http://www.globalinnovationindex.org/gii/main/reports/2009-10/FullReport_09-10.pdf
58. *iPad Wi-Fi + 3G Models Available in US on April 30* (2010, April 20). Retrieved October 8, 2011 from <http://www.apple.com/pr/library/2010/04/20iPad-Wi-Fi-3G-Models-Available-in-US-on-April-30.html>
59. *iPod History from Apple online*. (n.d). Retrieved May 11, 2001 from <http://www.apple.com/pr/products/ipodhistory>
60. *iTunes Tops 200 Million TV Episodes Sold, Including Over One Million HD Episodes* (2008, October 16). Retrieved December 15, 2011 from www.apple.com/pr/library/2008/10/16ABC-CBS-FOX-NBC-Offer-Incredible-Lineup-of-Programming-in-Stunning-HD-on-the-iTunes-Store.html
61. Isaacson, W. (2011). *Steve Jobs*. New York: Simon & Schuster.
62. Jaruzelski, B. & Dehoff, K. (2007). *The Customer Connection: The Global Innovation 1000*. New York: Booz & Company.
63. Jaruzelski, B. & Dehoff, K. (2010). *The Global Innovation 1000: How the Top Innovators Keep Winning*. New York: Booz & Company.
64. Jaruzelski, B. & Mainardi, R. C. (2011). *The World's 10 Most Innovative Companies, And How They Do It*. Retrieved April 7, 2011, from <http://www.forbes.com/2011/04/04/10-top-innovative-companies-apple-google-leadership-managing-how.html>
65. Lashinsky, Adam (2011, August 25). *How Apple Works: Inside the world's biggest startup*. Retrieved December 2, 2011 from <http://tech.fortune.cnn.com/2011/08/25/how-apple-works-inside-the-worlds-biggest-startup/>
66. Legatum Institute (n.d) . The 2010 Legatum Prosperity Index. Retrieved April 6, 2011 from <http://www.prosperity.com/rankings.aspx>
67. Leonard, D. A. & Swap, C. W.(1999). *When sparks fly: igniting creativity in groups*. Boston: Harvard Business School Press.
68. Levitt, T. (1962). *Innovation in marketing: new perspectives for profit and growth*. New York: McGraw-Hill Professional.
69. Linzmayer, W. O. (2004). *Apple Confidential 2.0: The Definitive History of the Worlds Most Colourful Company*. San Francisco: No Starch Press.

70. Marinova D. & Phillimore J. (2003). *Models of Innovation*. The International Handbook on Innovation. Oxford: Elsevier Science.
71. Moore, A. G. (2004). Darwin and the demon: innovating within established enterprises. *Harvard Business Review*, 82(7/8).
72. Maxwell E. I. (2009). *Managing Sustainable Innovation The Driver for Global Growth*. New York: Springer.
73. Moore, G. A. (2005). *Dealing with Darwin: How Great Companies Innovate at Every Phase of Their Evolution*. New York: Portfolio.
74. Morris, B. (2008, March 7). *Steve Jobs Speaks Out*. Retrieved December 11, 2011 from <http://money.cnn.com/galleries/2008/fortune/0803/gallery.jobsqna.fortune/>
75. Mossberg, W. (1998, July 30). *Apple Introduces iMac, A Fast and Potent PC*. Retrieved December 17, 2011 from <http://online.wsj.com/article/SB901747560996300000.html>
76. Muller, C. (2010). *Apple's approach towards innovation and creativity*. Munich: GRIN Publishing GmbH.
77. Murphy, K. (2011, July 4). *The paperless Cockpit*. Retrieved November 10, 2011 from http://www.nytimes.com/2011/07/05/business/05pilots.html?_r=4&pagewanted=1&hpw
78. Myers, S. & Marquis, D.G. (1969). *Successful industrial innovations: A study of factors underlying innovation in selected firms*. Washington: National Science Foundation
79. Ogg, E. (2010, March 19). *Apple patent and trademark skirmishes through the years*. Retrieved December 12, 2011 from http://news.cnet.com/8301-31021_3-20000751-260.html
80. O'Grady, J. (2009). *Apple Inc*. Connecticut: Greenwood Press
81. Organization for Economic Co-operation and Development (1999). *Managing National Innovation Systems*. Paris: OECD Publishing
82. Organization for Economic Co-operation and Development and Eurostat (2005). *Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data*. Paris: OECD Publishing.
83. Paczkowski, J. (2010, June 1). *Apple CEO Steve Jobs Live at D8: All We Want to Do is Make Better Products*. Retrieved November 13, 2011 from <http://allthingsd.com/20100601/steve-jobs-session/#>
84. Peterson, R. W. (2007). The Role of Consumer Preference Development in Incremental Innovation: How Diamond Multimedia Helped Create the iPod. *Texas Law Review*, 86, 1553.
85. Popper, B. (2011, August 25). *Steve Jobs and the Value of Saying No*. Retrieved December 2, 2011, from <http://www.betabeat.com/2011/08/25/steve-jobs-the-value-of-saying-no-wwdc-1997/>
86. Rainey, D. L. (2005). *Product innovation: leading change through integrated product development*. New York: Cambridge University Press.
87. Rao, V. (2007). Disruptive versus Radical Innovations. Retrieved March 15, 2011, from <http://www.ribbonfarm.com/2007/07/23/disruptive-versus-radical-innovations/>

88. Reichstein, T., & Salter, A. (2006). Investigating the sources of process innovation among UK manufacturing firms. *Industrial and Corporate Change*, 15(4), 653-682. doi: 10.1093/icc/dtl014
89. Rogers, E. (1995). *Diffusion of Innovations*. New York: Free Press.
90. Sande, S. (2009, July 29). *Retro Apple: The QuickTake 100 digital camera*. Retrieved December 15, 2011 from <http://www.tuaw.com/2009/07/29/retro-apple-the-quicktake-100-digital-camera/>
91. Sawhney, M., Wolcott C. R. & Arroniz I. (2006). The 12 Different Ways for Companies to Innovate. *MIT Sloan Management Review*, 47(3), p. 75-81.
92. Schmookler, J. (1962). Economic Sources of Inventive Activity. *The Journal of Economic History*, 22, p 1-20.
93. *Statement by Apple's Board of Directors (2011, October 5)*. Retrieved January 7, 2012 from <http://www.apple.com/pr/library/2011/10/05Statement-by-Apples-Board-of-Directors.html>
94. *Steve Jobs Resigns as CEO of Apple (2011, August 24)*. Retrieved October 7, 2011, from <http://www.apple.com/pr/library/2011/08/24Steve-Jobs-Resigns-as-CEO-of-Apple.html>
95. Stone, B. & Vance, A. (2009, June 22). *Apple's Obsession With Secrecy Grows Stronger*. Retrieved December 2, 2011 from <http://www.nytimes.com/2009/06/23/technology/23apple.html>
96. Stoneman, P. (2010). *Soft innovation: economics, product aesthetics, and the creative industries*. Oxford: Oxford University Press.
97. Tan A. J. (2008). Organising for Innovation. Retrieved April 7, 2011, from <http://www.improvementandinnovation.com/features/articles/organising-innovation>
98. *The 50 Most innovative companies 2011*. Retrieved April 7, 2011 from <http://www.technologyreview.com/tr50/2011>
99. Tether, S. B. & Tajar A. (2008). The organisational-cooperation mode of innovation and its prominence amongst European service firms. *Research Policy*, 37(4), p. 720-739
100. *The Apple Museum*. Retrieved May 9, 2011, from <http://www.theapplemuseum.com/>
101. *This Is How It's Done: Smart Business Moves (2009)*. Retrieved April 7, 2011, from http://www.inc.com/magazine/20090401/this-is-how-its-done_pagen_2.html
102. Thomke, S. & Feinberg, B. (2009, January 9). *Design Thinking and Innovation at Apple*. Boston: Harvard Business School Cases.
103. Trkman, P. (2010). The Critical Success Factors of Business Process Management. *International Journal of Information Management*, 30(2), 125-134.
104. Trkman, P., & McCormack, K. (2010). Estimating the benefits and risks of implementing e-procurement *IEEE Transactions on Engineering Management*, 57(2), 338-349.
105. Trott, P. (2005). *Innovation Management and New Product Development (3rd ed.)*. Essex: Pearson Education.
106. Ulwick, A. (2005). *What Customers Want: Using Outcome-Driven Innovation to Create Breakthrough Products and Services*. New York: McGraw-Hill Professional.

107. Utterback, J. & Abernathy, W. (1978). Patterns of Industrial Innovation. *Technology Review*, 80, 41 – 47.
108. Vella, M. (2008, January 11). *What Should Apple Do Next?* Retrieved October 15, 2011, from http://www.businessweek.com/technology/content/jan2008/tc20080111_391323.htm
109. Vogelstein, F. (2008). *The untold story: How the iPhone blew up the wireless industry.* Retrieved December 15, 2011 from http://www.wired.com/gadgets/wireless/magazine/16-02/ff_iphone?currentPage=all
110. Walker, R. (2003, November 30). *The Guts of a New Machine.* Retrieved December 1, 2011 from <http://www.nytimes.com/2003/11/30/magazine/30IPOD.html?ex=1386133200&en=750c9021e58923d5&ei=5007&partner=USERLAND&pagewanted=all>
111. West J. & Mace M. (2009, December 8). *Browsing as the killer app: Explaining the rapid success of Apple's iPhone.* Retrieved December 16, 2011 from <http://www.joelwest.org/Papers/WestMace2010-WP.pdf>
112. White, T. (2010). *iPads to be distributed to incoming class by Stanford medical school.* Retrieved October 15, 2011, from <http://med.stanford.edu/ism/2010/august/ipad.html>
113. World Economic Forum & Schwab, K. (2010). *The Global Competitiveness Report 2010–2011.* Geneva: World Economic Forum.
114. Yen, C. & Wei H. (2009). *Patterns of the Incremental and Radical Innovation of Design Driven Enterprises in Singapore* (Master's Thesis). Retrieved March 20, 2011, from <http://scholarbank.nus.edu.sg/bitstream/handle/10635/15909/weihangshuai20090605.pdf?sequence=1>
115. Yoffie, D. B. (2008). *Apple Inc. in 2008.* Boston: Harvard Business School Case.
116. Young, S. J. & William L. S., (2005). *iCon: Steve Jobs- The Greatest Second Act in the History of Business.* Hoboken. New York: John Wiley