

Innovation, Market Archetypes and Outcome



Soumodip Sarkar

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An Integrated Framework

With 70 Figures and 15 Tables

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Preface

If there is an award for one word that captures the imagination of academia, the media, businesses, as well as politicians, one strong contender must be the word “innovation”. This word holds the promise of unlocking the gates to enhancing firm productivity and promoting economic growth. “Innovation” is also the Holy Grail of the corporate world.

It is difficult to open a business journal or attend a seminar without somebody throwing “innovation” at us. A quick (non scientific) search reveals the astronomical number of times that “innovation” appears in the online media, as of January 25th 2006 – 131 million references! This phenomenon can be seen from the figure below which reveals this trend of the frequency of online visibility of “innovation”.

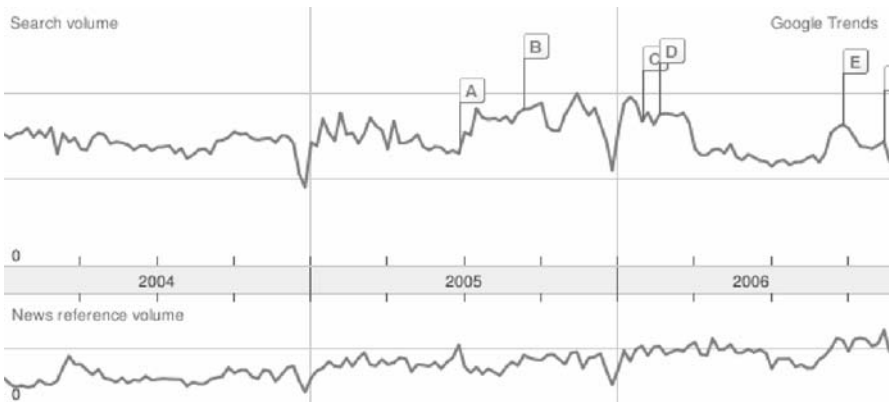


Fig. Online “innovation visibility”
Source: Google trends

Except for the “flat earth” equivalent of academics, there can be little doubt that innovation holds the key to unlocking firm competitiveness and growth. Yet, innovation is shrouded in a cloud of haze. Starting from its proper definition, and brushing aside management buzzwords swarming over the word, any serious study of innovation leaves one with more questions than answers...

This book is the spin off of my research into one question - can there be one framework that enables an understanding of innovation-market outcome linkages? Innovation literature is rich in typologies and descriptions of innovation dynamics, but is largely technology focused. The complex and profound interplay between strategy, innovation, markets and outcome is missing. And it was this that I had been seeking.

My research and my own varied background, led me to a way to explain this interplay – in the form of what I call the integrated innovation model.

This framework permit the academic, the management consultant and the manager alike to understand ‘where’ a product (or a single product firm) is located in an integrated innovation space, a space defined by market structure, degree of innovation and market outcome; ‘why’ it is so located and which then provides valuable clues as to ‘what’ to do while designing strategy. The model also explains much of the dynamics surrounding changing external climate and internal strategies. The integration of most of the important determinant variables in one visual framework with a robust and an internally consistent theoretical basis is an important step towards devising comprehensive firm strategy. The integrated framework provides vital clues towards framing a ‘what to’ guide for managers and consultants. Furthermore, the model permits metrics and consequently diagnostics of both the firm and the sector and this set of assessment tools provide a valuable guide for devising strategy.

I was never ambitious. At school I would envy my hard working friends who had all the answers and made their parents happy! I put it down to my lack of desire to be ‘like them’- meaning people who want to please others. As I grew older, things didn’t change. My colleagues in college and university were all fastidious folks, striving for success. I put down my lack of motivation as a sign that I was not an ambitious man! And this rationale has continued all through my life. Until recently. I have become ambitious.

An ambition to try to explain the strategy-innovation-outcome- market dynamics using a single analytical framework. The task was ever more ambitious because I didn’t want to restrict myself to the theoretical part, but to apply the framework to trying to explain many of the issues I felt are important in a study of innovation and markets. I wanted to study cases and apply the cases. Once I started on this journey, every piece of business news, I would see and try to explain through the lens of the integrated model!

This book is not a book about the innovation process, nor does it have a new set of taxonomy or classification of innovation types. Nor do I research the sources of innovation. It is also not meant to serve as a how to guide. It is simply a book that explains innovation and market linkages, and along the way, uses a unified framework to explain a variety of market dynamics using actual cases whenever possible. I also believe this book to be a work in progress....there is so much more to understand and explain!

There are a few people to whom I am extremely grateful for. First of course is my research assistant, Paulo Ferreira, to whom I am grateful for the research assistance, his patience and dedication. I also thank him for putting up with my own fastidiousness. I am also grateful to Isaura Paulino for identifying typesetting errors. The scope of the book required immense research and I am sure that despite my best efforts, there remain some errors, factual or otherwise. I am solely responsible for them.

I also want to thank Dwight Perkins for his support and the Asia Center at Harvard University where I spent part of my sabbatical researching this book. I am grateful to Dan Lomba for his friendship and hospitality during my stay in Boston. My thanks also go to the science foundation of Portugal (FCT) for the financial assistance I received during the course of writing this book. And finally I want to thank my family- my wife Cesaltina Pires and our kids Vasco, Raul, Bruno and Joana for putting up with me!

I dedicate this book to all those seemingly forever in the twilight zone, wanting to understand.

February 2007

Soumodip Sarkar

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1 Innovation

Just as energy is the basis of life itself,
and ideas the source of innovation,
so is innovation the vital spark of all human
change,
improvement and progress.

Attributed to *Theodore Levitt*

1.1 What Is Innovation?

If there is a popularity award for a word that captures the imagination of academia, politicians, media and businesses alike, one strong contender that stands out is the word “*innovation*”. Coupled with “*entrepreneurship*”, it holds the promise of unlocking the gates to the opening of new markets, enhanced firm efficiency and economic growth.

The word “innovate” is derived from Latin, *in+novare*, that is to “make new”, to renew or to alter. Put simply, innovation is about having and applying a new idea, or sometimes applying other peoples ideas in new and novel ways (see Box 6.2). As aptly noted by Michael Vance:

"Innovation is the creation of the new or the re-arranging of the old in a new way."

Many of the products that we consider to be innovative are often based on ideas of others or a rework of existing products in a way that turns out to be a hit with consumers (think iPod). In a mundane sense at many points in our lives, we are all innovators. The challenge arises when innovation is about an idea that is implemented successfully resulting in a positive outcome. For a firm this connected to the launching new products or improving on an existing product. Sometimes it involves organisational innovation that enhances firm efficiency. At a macro level, innovation is intimately connected to economic growth and welfare.

Although innovation may be intimately linked to technology, it doesn't necessarily have to have technology at the core. If the market accepts a new idea, and a firm is successful in transforming this new idea into a product that sells in the market place, then that is innovative. In the world of fashion, an outrageous costume (that nobody will ever wear) is considered innovative. Indeed the fashion world is driven by the constant drive to be innovative, which has often to do with the shock appeal. However technology by making a product difficult to being imitated provides the *stickiness* as well as potential for much higher growth that in turn provides sustainability to innovation (see Box 5.3).

Innovation has a broad canvas, including involving social change that need not involve technology. For instance the micro-credit model (pioneered by Muhammad Yunus who was honoured with the 2006 Nobel Peace Prize) which is an instrument in the fight against poverty, is also innovation. Innovation that involves reworking the business model need not directly involve technology.

So what again is innovation? Succinctly, innovation is the exploitation of new ideas which find market acceptance, often incorporating new technologies, processes, design and best practices. The innovation process generally involves the following phases:

- having a new idea or rethinking an old one
- recognising opportunities that exist or can be promoted
- choosing the best alternatives
- application of the idea and the process.

In *Winning at New Products*, Cooper¹ describes a structured process for new product development. The stages involve:

- Scoping: A quick desk research phase
- Building the business case
- Design and development
- Testing and validation
- Launch stage, where the product is commercialized.

¹ See Cooper (2001).

Importantly Cooper calls for the installation of *gates* where bad ideas get weeded out. These gates serve as checkpoints at the end of each stage, as shown in Fig 1.1.

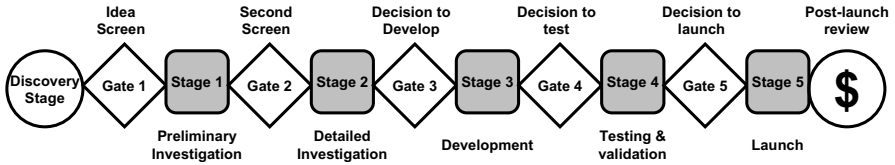


Fig. 1.1. The *Stage Gate* process

For a historical definition of innovation, one must turn to Joseph Schumpeter (1883-1953) who held technological change to be one of the major determinants of industrial transformation, and consisted of the introduction of new products (product innovation), new production processes (process innovation) and new management methods (organisational innovation). Schumpeter's definition of innovation was based upon the notion of the production function. As he noted²:

“We will now define innovation more rigorously by means of the production function previously introduced. As we know, this function describes the way in which quantity of product varies if quantities of factors vary. If, instead of quantities of factors, we vary the form of the function, we have an innovation. But this not only limits us, at first blush at least, to the case in which the innovation consists in producing the same kind of product that had been produced before by the same kind of means of production that had been used before, but also raises more delicate questions. Therefore, we will simply define innovation as the setting up of a new production function. This covers the case of a new commodity, as well as those of a new form of organization such as a merger, for the opening up of new markets, and so on. Recalling that production in the economic sense is nothing but combining productive services, we may express the same thing by saying that innovation combines factors in a new way, or that it consists in carrying out New Combinations, although, taken literally, the latter phrase would also include what we do not now mean to include, namely, those current adaptations of the coefficients of production which are part and parcel of the most ordinary run of economic routine within given production functions.”

Schumpeter distinguished between the trilogies of *invention*, *innovation* and *diffusion* (see Box 1.1). Interestingly Schumpeter's perspective of who

² See Schumpeter (1939).

is an entrepreneur is exactly the same as that of an innovator. He argued that the entrepreneur is the innovator who implements change within markets through the carrying out of new combinations. The new combinations could manifest itself as the one or a combination of the following:

- The introduction of a new good or quality thereof
- The introduction of a new method of production
- The opening of a new market
- The conquest of a new source of supply of new materials or parts
- The carrying out of the new organization of any industry

Management guru Peter Drucker explicitly calls for the entrepreneur to equip himself with the tool of innovation³, when he declared that⁴:

“Innovation is the specific tool of entrepreneurs, the means by which they exploit change as an opportunity for a different business or a different service. It is capable of being presented as a discipline, capable of being learned, capable of being practiced. Entrepreneurs need to search purposefully for the sources of innovation, the changes and their symptoms that indicate opportunities for successful innovation. And they need to know and to apply the principles of successful innovation.”

In a similar vein, Freeman and Soete (1997) couples entrepreneurship with innovation, declaring the latter to be:

“The first commercial application or production of a new process or product, it follows that the crucial contribution of the entrepreneur is to link the novel ideas and the market.”

³ However some authors believe that Drucker did not necessarily view the two as the same. J. Gregory Dees writing in *The Meaning of Social Entrepreneurship* noted that: “For Drucker, starting a business is neither necessary nor sufficient for entrepreneurship. He explicitly comments. Not every new small business is entrepreneurial or represents entrepreneurship. He cites the example of a husband and wife who open another delicatessen store or another Mexican restaurant in the American suburb as a case in point. There is nothing especially innovative or change-oriented in this.”

⁴ See Drucker (1993).

Box 1.1: When what we want is the weed

It is well known that many ideas, brilliant at first sight, often either never go beyond the drawing board, or quickly die in the market place. As we shall repeatedly encounter in this book, *outcome* and the *sustainability of innovation* are central themes that run all through the chapters of this book. Metcalfe (1999) said it best when he noted that “invention is a flower, innovation is a weed.”

The Schumpeterian trilogy divided technological change into three stages. Schumpeter identified the first stage as involving the invention process, encompassing the generation of new ideas. The second stage was the innovation process encompassing the development of new ideas into marketable products and processes. The last was the diffusion stage, and this third stage was marked by the spread of new products and processes spread.

As reported by authors Bobrow and Shafer (1987), this failure rate can reach an astounding 48% for new products! In his entertaining book Franklin (2003) exploring why innovation fails, he gives instances how simple oversights or mistakes can result in failure. Thus the \$125 million *Mars Climate Orbiter* satellite launched in December of 1998 failed because of the usage of the English measurement units and not metric!

If one was to seek some more formal definitions of innovation, there are plenty for company. For instance the Oslo Manual of the OECD (2005) makes a distinction between product and process innovation as follows:

“(1) A product innovation is the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses. This includes significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics.” (2) “A process innovation is the implementation of a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software.” (3) “A marketing innovation is the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing.” (4) “An organisational innovation is the implementation of a new organisational method in the firm’s business practices, workplace organisation or external relations.”

Each researcher tends to define innovation often based on his perspective on what is the most important aspect of innovation. Hence according to the authors Tidd et al (1997), innovation is:

“A process of turning opportunity into new ideas and of putting these into widely used practice.”

Whereas for Cumming (1998), the emphasis is on originality, when he defined innovation as:

“The first successful application of a product or process.”

Rogers (1962): defined and characterized innovation from the user perspective, presenting five criteria for (user based) innovation:

- “Relative advantage: Do people think it is an improvement over what already exists?
- Compatibility: Is it consistent with the values, experiences and needs of the people who might adopt it?
- Complexity: Will potential users find it easy to use and understand?
- Trialability: Can people experiment with the innovation before deciding to adopt it?
- Observability: How easy is it for people to see its results?”

Meanwhile Wikipedia, the brilliant example of what is now termed to be *open source* innovation, defines innovation as follows:

“The classic definitions of innovation include: 1) the process of making improvements by introducing something new; 2) the act of introducing something new: something newly introduced; 3) the introduction of something new; 4) a new idea, method or device; 5) the successful exploitation of new ideas; 6) change that creates a new dimension of performance.”

Box 1.2: Innovation from developing countries

Today, innovation is no longer confined to the developed economies. Many innovative enterprises both in the industrial as well as in the service sector are fast emerging from developing economies like India, China, Russia, Brazil, Philippines etc. Developing countries have not normally been associated with the dynamic use and development of technologies, but are now becoming increasingly successful in both technological parity and endogenous technology creation. Take the case of a developing country like Brazil, no more than 9% of whose manufactured exports are high technology products has now established a successful civil aircraft manufacturing industry. The rapidly rising software export from India is another example. Outsourcing of services to countries like India is no longer about cost reduction, but about sourcing innovation. Innovation leaders like Microsoft are now establishing R&D centres in countries like China and India from where some of its most important products are emerging.

The emphasis on investment in innovation, especially in Asia, is beginning to bear fruit. The share of global high-tech exports from Asian developing economies rose from 7% in 1980 to 25% in 2001. At the same time, the U.S. share of global high tech exports declined from 31% to 18%, according to the U.S. National Science Foundation (2005). Another telling indicator is that of the Asian share of all published scientific papers climbed from 16% in 1990 to 25% in 2004. Clearly over the following years, we shall increasingly witness developing countries, especially from Asia, leading innovation.

1.2 Why Innovate?

“Any business faces two basic demands: it must execute its current activities to survive today's challenges and adapt those activities to survive tomorrow's...The evidence suggests that most companies are far better at the executing half of the dialectic than at the adapting half.”

The McKinsey Quarterly: The Adaptable Corporation

In a knowledge-based economy firms must develop new products and services to increase turnover. In today's business environment, given acute

competition and the overall market instability, for firms to remain competitive and profitable, they must keep developing new ideas and concepts to keep ahead of the competition. It is only through innovation that firms can create value and differentiate their products and services from that of the competition. In a global economy competitive advantage is achieved via the access to the best research and thought leaders. Liberalization of trade—both merchandise as well as in financial markets, coupled with technological advances in information and communications technologies (ICTs), have greatly reduced geographic and trade barriers, leaving firms and countries ever more vulnerable to international competition. This reinforces the necessity for firms to innovate continually, adapt and create new products, services and entire business models, to compete beyond regional borders.

Technological progress according to the Nobel economist Robert Solow, has a strong influence on economic growth. Nations compete to attract innovative firms, for greater job growth and to improve productivity. A more innovative economy makes a greater investment in both people as well as in capital and has a greater capacity to attract and retain highly qualified people.

The correlation between innovative capacity and performance to economic development has been further strengthened over the recent decades. Recent studies indicate that technological progress is now responsible for up to one half of the growth of the US economy⁵. In most countries the success and growth of small and medium sized firms is connected with innovation.

At a firm level, studies point out to a positive correlation between innovation efforts as measured by R&D expenditure to outcome. A study by the British Department of Trade and Industry (DTI) – *The R&D Scoreboard 2006*, found that the links between R&D and business performance show up in wealth creation efficiency, sales growth and market capitalization⁶.

The study noted the positive impact of R&D expenditure which showed up in the:

⁵ Schacht (2000).

⁶ See www.innovation.gov.uk/rd_scoreboard/executive.asp

“Above average wealth creation efficiency is associated with above average investment intensity (R&D and Capex). In both the 2005 and 2006 Value Added Scoreboards, for the 12 sectors where R&D and Capex investment is significant, over 75% of companies having above average wealth creation efficiency also had above average investment intensity. Higher R&D intensity has been positively linked to higher sales growth... It is of particular interest that many leading companies in their sectors invested more heavily during recessions than their less successful peers.”

However using R&D alone is no guarantee of innovation success. Booz Allen & Hamilton’s annual study of the world’s 1,000 largest corporate R&D budgets, found that innovation *cannot be bought*⁷. The 2006 report did not find any significant statistical relationships between R&D spending and the primary measures of financial or corporate success: sales and earnings growth, gross and operating profitability, market capitalization growth, and total shareholder returns. Gross profits as a percentage of sales is the single performance variable with a statistical relationship to R&D spending. What matters is not the amount spent but how well it is spent. The study found many firms who spent less than their competitors on research and development, yet did better in their industries across a wide range of performance metrics. Booz Allen Hamilton’s termed such companies “high-leverage innovators.” Companies such as Apple, Toyota, Caterpillar, Black & Decker were all high leverage innovator performers.

Box 1.3: Macro innovation mapping

Although it is not easy to measure the degree of “innovativeness” of an economy, there are some reliable indicators of innovative capacity. One comprehensive study is the annual survey by the OECD, which comes up with the EIS (European Innovation Scoreboard) ranking of European countries. This ranking covers the 25 European Union member states, and a few other countries including the USA and Japan.

The indicators of the EIS summarise the main drivers and outputs of innovation.

(continued)

⁷ See Jaruzelski et al. (2006).

Box 1.3: Macro innovation mapping (cont.)

These indicators are divided into four groups:

- human resources for innovation (five indicators);
- indicators relating and related to knowledge creation (four indicators);
- indicators relating to transmission and application of knowledge (four indicators);
- finally, a fourth set of indicators relating to innovation finance, output and market (seven indicators).

The figure below shows the innovation scores of selected countries in 2005.

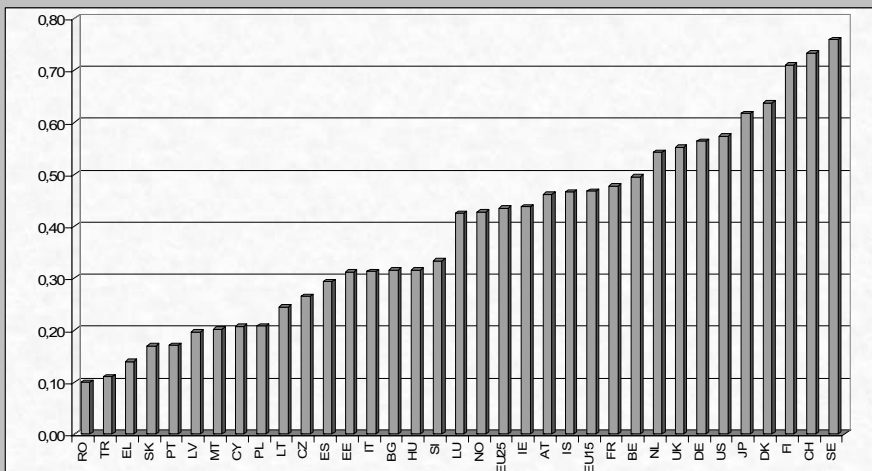


Fig. Box 1.3. European Innovation Scoreboard (2005)

1.3 Classifications

Firms on the innovation path can choose to work from either of two starting points – creating completely new products or services (radical innovation) or they can make improvements on an existing product or service. Although not necessarily the same, incremental improvements of products can lead to product differentiation as well.

The difference between these two starting points is a central theme in research literature on technological innovation, where innovation is broadly divided into either radical or incremental innovation⁸. Radical innovation is thus in the Schumpeterian sense, something that is totally new, in the five areas defined earlier. Incremental innovation generally entails step-by-step improvements of existing products and tends to further strengthen market position.

But categorizing innovation in either of the two camps has not been to the satisfaction of many researchers. It fails to capture the degree of innovation in a product, and hence much research over the last two decades has been devoted to the classification of innovation.

This classification of product innovation has been by and large based along one or both of two dimensions – technology and markets. Abernathy and Clark (1985) for instance categorized four different types of innovation spaces, determined by a market dimension and technological dimension. The market dimension (creating new and/or breaks down existing market linkages vis a vis reinforcing existing market linkages) is mapped against the technological dimension (innovation that makes existing competence obsolete within the technology and production and at the other extreme innovation that reinforces existing competence within technology and production). This gives rise to four different innovation spaces as depicted in Fig.1.2 below. This innovation typology described by the *transilience map* of Abernathy and Clark, was used to describe a product's life cycle.

Further work by Clark, this time with Henderson⁹ described another innovation space, where the horizontal axis described the innovation's effect on the existing product's components while the vertical axis symbolizes the innovation's effect on the linkages between the components. This typology described four different product innovations: architectural innovation, incremental innovation, modular innovation and radical innovation. Thus this typology was based on the fact that a product is a sum of its components, the impact of innovation on the links between the components and on the components described the type of innovation.

⁸ See, in example, Henderson and Clark (1990), Tushman et al. (1997), Chandy and Tellis (1998) and Leifer et al. (2000).

⁹ See Henderson and Clark (1990).

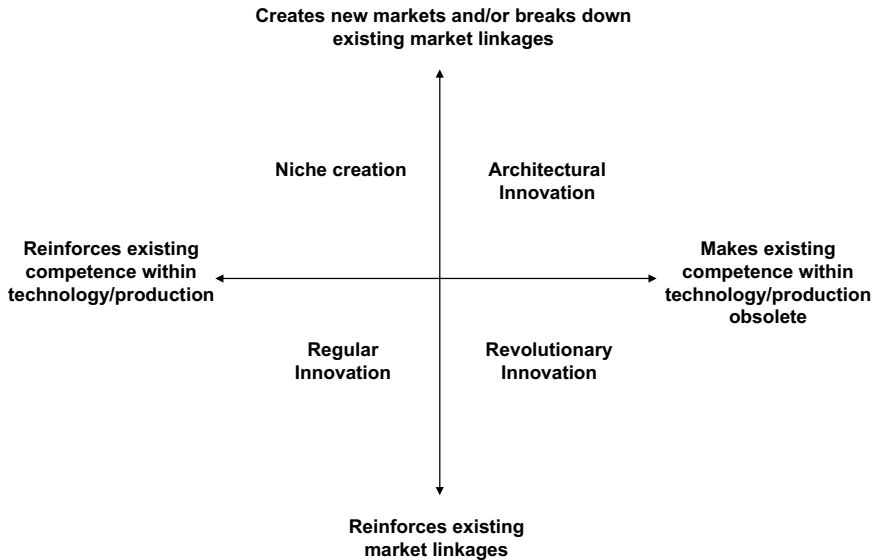


Fig. 1.2. *Transilience map* of Abernathy and Clark (1993)

The creator-user perspective of innovation was proposed by Afuah and Bahram (1995) who argued that it was necessary to view innovation from different perspectives, with regards to different actors. Thus an actor dimension was added which permitted innovation to be also seen in the context of the degree of ‘novelty’ from the actor perspective.

1.4 So What’s New?

Innovation is of course more than creating completely new products or services. In a classic study of innovation published in 1982¹⁰ a survey was undertaken of products considered ‘new’ between the period 1976 and 1981. Overall 13000 of these ‘new’ products introduced by 700 firms were surveyed. The study found that there were actually six types of newness, as shown in Table 1.1 below.

¹⁰ Booz Allen & Hamilton New Product Management in the 1980s.