

LINK: [HTTPS://WWW.EDUTUS.HU/CIKK/COMPLEXITY-OF-THE-PRODUCT-INNOVATIONS-IN-IMPROVEMENT-OF-THE-COMPANIES-BUSINESS-PERFORMANCE/](https://www.edutus.hu/cikk/complexity-of-the-product-innovations-in-improvement-of-the-companies-business-performance/)

COMPLEXITY OF THE PRODUCT INNOVATIONS IN IMPROVEMENT OF THE COMPANIES BUSINESS PERFORMANCE

DR. ZOLTÁN PEREDY, Head of the Engineering Institute, Edutus University
e-mail: peredy.zoltan@edutus.hu

GAO YUXIAO, BSc. Student, Edutus University, Department of Business Management
e-mail: 2399702497@qq.com

DOI [10.47273/AP.2023.29.4-31](https://doi.org/10.47273/AP.2023.29.4-31)

ABSTRACT

In the 21st century, in the economically developed countries around the globe, the ability of business organizations to innovate their offered products is an important source of their strategic, long-term competitive advantage. Living in a complex and dynamic world, innovation and entrepreneurship are playing crucial role for economic development. New scientific and technological (S&T) revolution is developing rapidly and is breeding new major breakthroughs that will profoundly change the face of the economy and society. The speed of transformation of science and technology applications is accelerating, creating new opportunities for catching up and leapfrogging. Throughout the world, many countries have made strengthening science and technology innovation a national strategy, made investment in science and technology a strategic investment, significantly increased investment in science and technology, and advanced the deployment and development of frontier technologies and strategic industries, implemented major science and technology programs, and made efforts to enhance national innovation capabilities and international competitiveness. Similarly, for enterprises, the achievement of their core competitiveness depends on their ability to innovate their products. This review paper is aiming to reveal the complex nature of the different product innovation types impacts on enterprises business performance, which can be key importance how to shaping their development and innovation strategies. By analysing the impact of different product innovation types, companies can learn about the applicable scenarios and changing trends in the industry for different types of innovation. In addition, by comparing established innovation types with past innovation practices, it is possible to establish a more suitable and practical innovation environment and mindset to improve the competitiveness, market share and economic efficiency of the company.

Keywords: product innovations, strategic competitive advantage, S&T revolution, profound changes, business performance

1. Introduction

According to the different contents of innovation, in the company management practices the most dominant innovations can be categorized into two main types: product innovation and process innovation. In 1912, Schumpeter first proposed the "innovation theory" in his book

"Theory of Economic Development" that innovation is either the creation of a new production function or recombination of factors of production. According to the Shumpeter's theory, innovation consists of five aspects: a) the production of a new product; b) the adoption of a new method of production; c) the opening up of a new market; d) the capture or control of a new source of raw materials and semi-finished products; e) the realization of a new industrial organization (Hospers 2005; Sledzik 2013; Yang and Zhong 2010; Ziemnowicz 2013).

The concept of innovation has a very broad scope, and its purpose can be divided into increasing the price of a product or market demand, and reducing production costs. It can be summarized as follows: on the one hand, a company can change the characteristics of a product or create a new product or even a new market; on the other hand, a company can improve the efficiency of factor production by changing the production methods, raw materials or organization. The first type of innovation is called "Product Innovation", which helps to improve product quality or enhance product differentiation, while the second type of innovation is called "Process Innovation", which helps to reduce the marginal cost of production. Research on product innovation and process innovation has focused on analyzing manufacturers' investment decisions on product innovation and process innovation in specific contexts through theoretical models. In addition, some of the existing literature also explores empirically how to choose appropriate product innovation and process innovation strategies using national, industry-specific or firm-specific data. In terms of established studies related to theoretical models, the research methods have undergone development from static models to dynamic models in recent years, from considering the innovation strategies of monopolistic manufacturers to later oligopolistic market models, and the results of theoretical studies have gradually approached realistic implications.

In the dynamic studies of product innovation and process innovation, the prevailing view is that the investment cycle of product innovation is ahead of process innovation. Firms first need to set the degree of product differentiation through product innovation, and then compete in the market in terms of quality or price (Luca et al. 1998). Abernathy and Utterback's model suggests that firms tend to spend most of their R&D investment on product innovation in the early stage of development, mainly because the market potential in the early stage of the industry is huge and firms need to find the right products to meet the consumer demand (Atsushi 2013). Porter (2010) argues that as the industry grows there will be a large number of new products coming into the market and the product. Klepper (1996) argues that in the early stage of development, firms need to rely on new products to attract consumers, so product innovation dominates R&D investment at this time, and as the scale of production increases, the benefits of process innovation are gradually reflected. Filson (2002) also shows that product innovation can bring many new consumers to the firm in the early stage of development, so the return on investment is significantly higher than that of process innovation; while the return on process innovation can only be seen when the firm has enough capacity. However, according to Adner and Levinthal (2001), the traditional life-cycle research approach is biased, arguing that it focuses too much on the internal development of the firm, and they propose a research approach based on the interaction between technological innovation and heterogeneous consumer demand. The difference is that they argue that the first stage of the life cycle will not always be accompanied by large-scale product innovation, depending on the initial performance of the product in the market. The second stage will be also dominated by process innovation, but this does not mean that product innovation will decline precipitously at this point. The main difference between Adner and Levinthal's (2001) findings and the traditional view is that they argue that for firms, their new products are not necessarily be completely innovative. For example, what the iPhone is to the world and what Xiaomi is to the world are completely different starting points, so different firms will have

different investment strategies at the initial stage. Saha (2007) argues that buyers in the early stages of a product are more sensitive to product quality, and demand improves significantly with product quality. In the maturity stage of the industry products are sold more to low-end consumers, who tend to be more concerned about price when the product can meet their demand, that is, consumers' marginal willingness to pay for product quality will diminish at the margin as product output rises. Bacchiega et al. (2010) research work pointed out that the firm's choice of innovation from the initial state up to the final equilibrium point, including which innovation to choose, to carry out both innovation activities or not, is dependent on the variability in the initial state and the production. The marginal cost of the innovation does not exist as uniform standard. However, there is a complete spillover effect of product innovation, which leads to a higher willingness of manufacturers to carry out process innovation than product innovation. Analyzing the impacts of different product innovation types on enterprises, it can be theoretically elaborated on the inherent characteristics and innovation paths that different product innovation types have, so that enterprises can better understand the trends of changes in their own market returns and risks, grasp market information and make response strategies (Christien 2009).

This review paper provides insight in the true nature of the different product innovations revealing the linkages between the different elements, and at the same time all of those factors which have crucial impacts on the companies business performance. Furthermore, it suggest recommendations for their future development directions and strategies.

2. Methodology

In this paper, the authors made top-down approach deductive research strategy, which means studying the available relevant theoretical literatures as reference base, gathering and analyzing data and draw conclusions. The main methodology was quality research techniques based on secondary or “desk” research analyzing scientific publications, studies, online literature sources. For easier understanding the complexity, different approaches and characteristics of product and process innovations, at the end of the appropriate sections, the authors enlightened the previously discussed elements with relevant practical company examples.

The conclusions and suggestions made during this analysis in this article reflect the private professional opinion of the authors.

3. Product and process innovations in depth

3.1. Main forms of the product innovations

Product innovation has long been one of the focal strategies for corporate and even industrial development. However, there is no broad consensus in the academic community on the definition of product innovation.

The OECD defines product innovation as a change in product development or production technology that occurs within a business entity or industry in order to be able to offer new or better products or services to users (OECD 2018). Utterback and Afuah (1998) considers product innovation as the introduction of one or more new technologies or combinations of technologies in the production process in order to meet the potential needs of consumers or markets, and the commercialization of the process. In his book "Technological Innovation", Fu Jiaji defines product innovation as: the purpose of product innovation is to obtain a new or improved product in terms of performance, that is, the commercialization of a product with changes or improvements in the technical level (Fu 1998). According to the amount of

technological change, product innovation can be divided into major product innovation and incremental product innovation.

Combined with the above-mentioned scholars' views product innovation is actually a question of "what products are produced by enterprises". In other words, product innovation takes the real or potential market demand as the starting point, and uses the application of technology in the production process to develop differentiated products or brand new products to meet the real market demand or activate the potential market into a real market, so as to realize the value of products and gain profits. From this perspective, product innovation can be divided into new product development brand new product innovation and product performance improvement improved product innovation. New product innovation refers to the creation of an entirely new product to meet consumer needs, with significant changes in product use and its principles. Performance improvement product innovation refers to the renovation of old products, the form and function of a product that previously existed in the enterprise or the market are appropriately changed to suit the current requirements of consumers, that is, without significant changes in technical principles, based on the market needs of the existing products to expand the functions and technical improvements. New product development and performance improvement are both based on changes in product performance, but the difference lies in the magnitude of the change and a different formula. New product development has a significant multiplicative effect on product performance, while performance improvement has an additive effect on product performance with smaller changes.

Product innovation originates from the market demand, from the market demand for the enterprise's product technology, that is, technological innovation activities to market demand as the starting point, clear product technology research direction, through technological innovation activities, to create suitable for this demand of marketable products, so that market demand can be met. In the real enterprise, product innovation based always on the two dimensions of technology and demand. According to the characteristics of the industry and the enterprise, the enterprise matches the market demand with the technical capability of the enterprise and seeks the best combination of risk and benefit. The driving force of product innovation is fundamentally the result of the joint action of technology promotion and demand pulling. The interpretation of product innovation in modern times consists of three main aspects: the core issue of the product, the form of the product and the additional content of the product, which are integrated together to form a whole new form of product. At present, product innovation is carried out by analyzing and designing all aspects of the product by focusing on the market, with the aim of enhancing the overall position and competitive advantage of the product in the market, increasing the added value of the product and bringing economic benefits to the enterprise. In addition, product innovation is the use of a variety of technologies to improve the quality and quantity of products in order to better meet the needs of consumers (Slomp et al. 2011).

Many people have different interpretations of product innovation. For example, some researchers interpret product innovation from three aspects, namely, the core of the product, the form of the product, and the addition of the product, and the comprehensive integration of the three levels constitutes a new overall product. In terms of modern product innovation, it is mainly market-oriented, to carry out various aspects of product innovation, to improve the competitiveness of products in the market, to achieve the benefits and values of products. In terms of individual products, it is mainly through the improvement of a certain technical and economic index parameter for the product, so that the product in terms of quality and quantity

to improve, breakthrough. For example, new technology development for old products, overall product design, conception, trial production, product marketing, etc., always through the whole process of the product. Other researchers analyze product innovation from another aspect, that is, the innovation of the product itself, the application of various technologies to improve the quality of the product and better meet the needs of people's applications (digitalcommons.ursinus.edu). In simple terms, product innovation refers to product changes that occur in order to provide new or better services to users. For example, in order to meet the customer's demand for photos, cell phone businesses have come up with various types of cell phone products with double, triple and quadruple cameras.

Product power mechanism

Product innovation can be divided into newly developed product innovation and already existing but improved product innovation. New product innovation refers to the significant technology-driven or demand-driven changes in product use and its principle. Improved product innovation refers to the functional expansion and technical improvement of existing products based on market needs without significant changes in technical principles. In the real enterprise, product innovation is always in the two dimensions of technology and demand, according to the characteristics of the industry and the enterprise, matching the market demand and the technical capability of the enterprise, and seeking the best combination of risk and benefit. The driving force of product innovation is fundamentally the result of the joint action of technology propulsion and demand pull (Rahaman and Muhamad 2004).

Product innovation model

According to the sequence of innovative products entering the market, the modes of product innovation are first innovation and imitation innovation. First innovation refers to relying on one's own efforts and exploration to produce a breakthrough in core concept or core technology, and on this basis, completing the subsequent stages of innovation, taking the lead in commercializing technology and market development, and launching a brand-new product into the market. Imitation innovation means that enterprises learn and imitate the innovative ideas and innovative behaviors of the pioneer innovators, learn from the successes and failures of the pioneers, introduce and purchase the core technologies and core secrets of the pioneers, and improve and perfect them on this basis for further development. In "New Product Development Process (NPDP) Management", Robert Cooper listed six different types of new products as you can see briefly summarized in the Table 1.

Table 1. Main forms of NPDP Management

Type	Description
New products	This type of new product is the first of its kind and creates a whole new market. 10% of new products are of this type.
New product lines	These products are not new to the market, but are new to some manufacturers, and about 20% of new products are classified as such
Supplement to existing product line	These are new products that are part of the factory's existing product line. They may be new to the market. These products are one of the more popular types of new products, accounting for about 26% of the new products introduced.

Improved versions of older products	These not-so-new products are essentially substitutes for the old product varieties in the factory. They improve on performance and provide more intrinsic value than older products, and this category of new and improved products accounts for 26% of new products launched.
Repositioned products	Suitable for old products in new areas of application, including repositioning in a new market, or applied to a different area, such products accounted for 7% of new products.
Cost reduction products	It is a bit of a stretch to call these products new. They are designed to replace the old products, no change in performance and utility, but only cost reduction, such products accounted for 11% of new products.

Source: Own edition based on (Cooper and Kleinschmidt 2016; Muhamamad and Suzianti 2021)

The specific content of product innovation can be divided into three parts. The first is that the process of product innovation is consistent with the outcome of the product, and the two are unified and cohesively combined. The second is that product innovation is a high-risk, high-reward project that can bring huge economic benefits while being highly risky. Finally, based on the form or mode of product innovation, product innovation is formed through consumer stimulation and is widely carried out based on the use of technology in the process.

3.2. Features of process innovation

Process innovation is also an indispensable part of technological innovation. Despite of this fact, there is no consensus on the definition of process innovation. The OECD defines process innovation as adoption of technically new or improved production methods, organizational forms, including the delivery methods of products. These methods and forms involve changes in equipment, production organization or a combination of several aspects, or they may originate from the application of new knowledge (Chang et al. 2021). Process innovation refers to the change of production technology, which includes new processes, new equipment and new organization and management methods. Process innovation is closely related to the improvement of product quality, reduction of raw material and energy consumption, and improvement of production efficiency (Fu 1998). According to other scholars and experts process innovation is a complete process from the generation of a new process blueprint to the design and development of the process flow, and then to the testing and application of the new process. The process innovation includes the development of new processes, improvement of old processes, new equipment, new management and organizational methods (Guo and Wang 2003).

Combining the above-mentioned scholars' views, process innovation actually solves the problem of "what production materials, methods and means are used by enterprises to make products that consumers need". For example, the production process of cell phone can be improved to increase production efficiency or reduce production cost. According to the purpose and central content of innovation activities, process innovation can be divided into the following types:

Process innovation around improving product quality grade rate

The product quality grade rate is an index that characterizes the quality level and technical specification compliance. In order to improve the product quality grade rate, enterprises must coordinate innovation in three aspects: process technology, process management and process discipline. Neglecting any of these aspects may make it impossible to guarantee product quality and the output rate of superior products (Gu and Zhang 2019).

Process innovation around the reduction of quality loss rate

Quality loss rate is the sum of internal and external quality loss cost in a certain period of time as a proportion of the total industrial output value in the same period, which is an index to characterize quality economy. In order to reduce scrap and loss, the enterprise process should be coordinated with innovation in software such as design and process technology and hardware such as material and equipment.

Process innovation around improving the sales rate of industrial products

The sales rate of industrial products is the ratio of sales output value to current industrial output value in a certain period of time, which reflects the degree of product quality to meet the needs of the market. Through process innovation, enterprises can not only produce unique physical and chemical products, but also provide high-quality service products, which can attract customers, expand the market and expand sales.

Process innovation around improving the output rate of new products

Product output rate is the ratio of new product output value to industrial product output value in a certain period of time, which reflects the composition of new products in the enterprise's products and reflects the state of technological progress and the comprehensive level of technology of the enterprise. The production of modern enterprises often requires process technology integrated by various disciplines and technologies, especially for technology-intensive innovative products, which require a combination of mechanical, electrical, optical, chemical, microelectronics, computer, control and testing technologies, especially Computer Integrated Manufacturing System (CIMS) technology. To achieve effective control and coordination of information flow, material flow and decision flow of product life cycle, in order to meet the requirements of competitive market for high quality, flexible response and low cost of production and management process.

Process innovation around resource saving and cost reduction

Traditional natural resources are becoming increasingly scarce. By improving the original process, using existing resources scientifically, rationally, comprehensively and efficiently, or adopting new processes and developing and using new resources, enterprises can save energy, reduce material consumption and energy consumption, and lower product costs.

Process innovation around the beneficial to the environment

Low or no pollution has become an increasingly prominent requirement of society, government and people for enterprise production and its products. Through process innovation, enterprises can reduce pollution in the production process and provide pollution-free products.

The below Table 2. indicates the possible process innovation strategic solutions

Table 2. Process innovation strategies and their essence.

Type of the strategy	Main focal points
Market-oriented	Development of new processes must be based on and meet market demand.
Technology-oriented	Use the new technology in the society or the original technology advantage of the enterprise to develop new technology.
Resource-oriented	Use the existing resources or newly discovered resources in the enterprise's location for process innovation.
Integrated-oriented	Integrated-oriented strategy refers to process innovation by combining the advantages of technology and market.

Source: Own edition based on Li (2010)

Process innovation focuses on the process of activities; the results of product innovation are mainly reflected in the material form of products, while the results of process innovation can permeate both the laborers, labor materials and labor objects and the way of combining various productivity factors; the producers of product innovation mainly provide new products for users, while the producers of process innovation are also the users of innovation.

Product and process innovations play different roles in the formation of manufacturers' competitive advantages. Product innovation is good for enterprises to seize market opportunities, develop new markets and increase the market share of new products; process innovation can enable enterprises to provide better quality products to the market with lower cost, faster speed and higher labor productivity. Both innovation are aimed at improving the socio-economic benefits of enterprises, but in different ways. Product innovation focuses on the results of activities, while process innovation focuses on the process of activities; the results of product innovation are mainly reflected in the material form of products, while the results of process innovation can be permeated in both laborers, labor materials and labor objects, and also in the way of combining various productivity factors (www.highprobiotics.com).

4. Dynamics of product innovations

4.1. Abernathy-Utterbach model and its applications

The opportunities for innovation change over time. In new industries, there is much scope for innovation around the concept of new products and services. More mature industries tend to focus on process and positioning innovation, finding ways to sell products and services more cheaply and quickly, or finding and capturing new market segments. Abernathy W. and Utterback J. developed the innovation lifecycle model to describe three different stages of development of innovation models (Atsushi 2013). It was found that all three of them follow different developmental patterns but are also organically linked to each other analysed in terms of the product life cycle, there are three distinct phases in the interaction between product innovation, process innovation and organisational change (Hu and Junyan (2019).

The process flow phase - exploration, uncertainty, flexibility

There is a "flow phase" (or "gestation phase") under discontinuous conditions, i.e. when a new technology or market emerges. During the process flow phase, products change rapidly and designs are diverse; several small firms coexist and innovation focuses on product structure and performance; there is a high degree of uncertainty about innovation and firms do not know which products have the greatest market potential. Many market players (including a large number of start-ups) are therefore engaged in a great deal of experimentation

(accompanied by many failures) and rapid learning. This is why product innovation is the dominant type of innovation in this phase.

The process flow stage is organically organised, with an emphasis on constant change of work, no hierarchy, a high level of innovation and a concentration of power in the hands of innovative entrepreneurs. It is characterised by the co-existence of old and new technologies and the rapid improvement of both. The "sailing effect" can often be observed in this phase, where established technologies accelerate their own improvements as a response to new competing technologies.

Process transition phase - dominant design

As the product improves, product innovation begins to decrease. Customers have a preference for the product and sales, advertising and maintenance demand a higher degree of standardisation in production; there is less innovation to improve product performance, process innovation is progressively more active and dominant design begins to reveal itself. Manufacturers are interested in maximising sales and market share. During this phase, the role of the product is better understood and companies begin to compete for product diversification. The technological system of the company emerges as a parallel between product innovation and process innovation, for example. However, the dominance of product innovation begins to falter and process innovation becomes increasingly important in the competition.

In the process excess phase, the individual and the organisation gradually become interdependent, the organisation emphasises coordination and control, the personnel grows, and power shifts to those with managerial competence. Beyond this, the main activity of innovation shifts from the development of the underlying concept to a focus on product differentiation, and more stable, cheaper, higher quality and more varied functionality.

Process clarification phase - standardisation, integration

The formation of a leading design means that product innovation enters a process clarification phase. The market management system of the enterprise is based on price competition; the production system of the enterprise emphasises production efficiency and economies of scale; the technological system of the enterprise is based on gradual innovation in both product innovation and process innovation (Chang et al. 2021). At this time, the majority of the enterprises involved in the competition are eliminated, and a few enterprises become to oligopolistic.

Table 3. Key components of Abernathy and Utterback's innovation lifecycle model

Innovative characteristics	Process flow stages	Process Transition Phase	Process Definition Stage
Competitive focus	Functional product performance	Product differentiation took place	Cost reduction
Innovation driven	Information on customer requirements, technical input.	Creating opportunities by expanding in-house technical capabilities	Pressure to reduce costs, improve quality.
Main types of innovation	Recurring key changes to the product.	As the scale of production increases, the need for significant process innovations.	Incremental product and process innovation.

Product lines	Variety, often including bespoke designs.	Including at least one stable or dominant design	Incremental product and process innovation.
Production processes	Flexible but inefficient, with experimental and frequently changing objectives.	Becoming increasingly stringent and well-defined.	Efficient usually form capital intensive and relatively rigorous.

Source: Own edition based on Atsushi (2013)

Some examples on the practical applicability of Abernathy-Utterback model

- Two types of enterprise category existed in the early period of the emerging and rapidly developing semiconductor industry—established units that came into semiconductors from vested positions in vacuum tube markets, and new entries such as Fairchild Semiconductor, I.B.M., and Texas Instruments, Inc. The actors of the first category responded to competition pressure arising from the newcomers by emphasizing process innovations. Meanwhile, the latter sought entry and strength through product innovation. Since 1968, however, the basis of competition in the industry has changed; as costs and productivity have become significantly more important, the rate of major product innovation has decreased, and effective process innovation has become an crucial factor (Mahoney 2010).
- In many cases, the dominant design is not always the best, but often only the supposedly best solution for a problem. For example, Aerovelo Ltd. developed an aerodynamic recumbent wheel that set the world record for the fastest car powered by muscle power. The driver is hidden under an egg-shaped shell made of carbon fibers equiped with a screen and two cameras. The vehicle called Eta and alone weighs only 25 kilograms. According to the afterfeed, the wheels of the rotate three times as fast as the wheels of conventional bicycles and come to 1200 revolutions per minute. In 2016, Todd Reichert completed a 200-meter measuring distance at a speed of 144.17 kilometers per hour on this fully clad recumbent "Eta". Flying Scotsman" Graeme Obree, who set the hour record in track cycling in 1993 and 1994, is also experimenting with alternative frame shapes for bicycles: In 2013 he set a new world speed record in prone position on his self-built Beastie Bike at the World Human Speed Championships in Battle Mountain (Nevada). While Obree's interpretation of the bike is probably not very practical, nothing speaks against the use of the recumbent in everyday life - except that for many of us this vehicle is not a "bike" (Eschberger-Friedl 2021)
- Although this model originally developed for manufactured products the model also works for services — for example the early days of Internet banking were characterized by a typically fluid phase with many options and models being offered. This gradually shifted towards a transitional phase, building a dominant design consensus on the package of services offered, the levels and nature of security and privacy support, the interactivity of website. The field has now become mature with much of the competition shifting to marginal issues like relative interest rates (MBA Knowledge Base 2023).

4.2. Sources of companies product and process innovations

Technological innovation is the main element of innovation in enterprises. A large number of innovative activities in enterprises related to technology, and one of the main characteristics of modern industrial enterprises is the extensive use of advanced science and technology in the production process. Innovation arises from a range of different opportunities, both internal and external to the firm. The American scholar Drucker has grouped these different factors that induce innovation in firms into seven different sources of innovation (Drucker 2002; Darroch and Miles 2015).

Unexpected success or failure

Unexpected results often occur in business operations: companies struggle to develop their basic business and invest a great deal of human and material resources in it, only to have it regrettably shrink; in contrast, other businesses grow silently and rapidly without sufficient attention. Whether it is an unexpected success or an unexpected failure, it may be a sign of an opportunity for the company, which must be carefully analysis and argumentation.

Internal and external inconsistencies

Incongruence occurs when a company's assumptions about the external business environment or internal business conditions conflict with reality, or when the actual business situation is not consistent with the ideal situation. This inconsistency can be either the result of a change that has already occurred or a symptom of a change that is about to occur. As with unexpected events, changes, whether they have occurred or are about to occur, can provide an opportunity for technological innovation. It is therefore important that companies look carefully at the existence of inconsistencies, analysis the reasons for them and use them as an opportunity to organize technological innovation.

The need for process improvement

While accidents and inconsistencies are analysis in terms of the relationship between the company and the outside world, the need for process improvement is related to the internal work of the company (the internal production process). This need for innovation is the result of improving an existing process (especially a process) by removing a weak link and replacing it with a new process or method redesigned using new knowledge and technology in order to increase efficiency, ensure quality and reduce costs. As this need for innovation has often existed for a long time, so once adopted, people often have a sense of what should be or should have been, and thus may be quickly accepted by the organization, and soon become a common standard. Process improvement can be both a logical consequence of scientific and technological development, and a driving force in promoting and facilitating it. In fact, no improvement is possible until the knowledge needed for process improvement is available.

Changes in industry and market structure

Companies operate within a certain industry structure and market structure. The industry structure refers mainly to the relative size and competitiveness of the different enterprises in the industry and the resulting concentration or fragmentation of the industry; the market structure is mainly related to the characteristics of consumer demand. These structures are both the result of the combined production and operation of the various enterprises involved in the industry or market, and also govern the activities of these enterprises. Once the industry structure and market structure have changed, enterprises must quickly react to them, organizing innovation and adjustment in production, marketing and management, otherwise they may affect their relative position in the industry, or even bring about operational disasters, leading to a crisis of survival of the enterprise. On the contrary, if the company

responds in time, this structural change will bring the company many opportunities for innovation. Once an enterprise is aware of a certain change in the industry or market structure, it should quickly analysis the possible impact of this change on its business and determine the direction in which it should adjust its operations.

Demographic changes

The impact of demographic factors on business operations is multifaceted. As an indispensable resource for business operations, demographic changes directly determine the supply of labour in the market and thus affect the cost of production; as an end-user of a company's products, the size of the population and its composition determine the structure of the market and its size. In view of this, demographic changes are likely to provide opportunities for technological innovation.

Changes in perceptions

Perceptions and ideas determine consumer attitudes, consumer attitudes determine consumer behaviour and consumer behaviour determines the popularity of a specific product in the market. Changes in consumers' perceptions affect the marketability of different products and provide companies with different opportunities for innovation.

Generation of new knowledge

The emergence of a new type of knowledge provides an exceptionally rich opportunity for business innovation. Among the various types of innovation, innovation based on new knowledge is the most valued and welcomed by companies. At the same time, it is also the most unpredictable and difficult to manage in terms of the timing of innovation, the probability of failure or the expectation of success, and the degree of challenge it poses to the entrepreneur.

Product innovation is a systemic project that starts from the enterprise and is oriented towards market demand, with the aim of achieving satisfactory economic and social benefits for the enterprise. From an examination of the history of the development of S&T and analysis of the formation process of a series of high-tech products today, it is easy to see that if the development of science originated to a large extent from man's curiosity to explore the laws of nature, the development of technology stems from man's pursuit of the ability to solve the problems encountered in production and life. Even the development of high technology, which today is generally considered to be very closely linked to science and basic research, is intrinsically driven by people's need to satisfy various manifest and potential application purposes.

Achieving the satisfaction of customer needs

The essence of whether customer needs can be satisfied is the sign of whether the enterprise product innovation can be recognized and tested by the market. Enterprises should study the various behaviors of products in the process of customer consumption and use, understanding the changing trend of customer needs. Furthermore, analysis the degree of customer satisfaction from the core benefits of products, brands, packaging, pricing and other aspects, find out the degree of customer satisfaction and differences between competitors and similar products in the market, and find out the degree of customer satisfaction from customer needs. The degree of customer satisfaction and differences, from the satisfaction of customer needs to grasp the product innovation (Hong et al. 2014).

Improving corporate reputation, marketing capability and R&D capability

Enterprise reputation is a valuable intangible asset in market competition, and its reputation directly affects the survival, development and growth of the enterprise; the marketing capability of the enterprise is focused on the grasp of customer needs, market changes and competition direction, and the key to the success of the enterprise is the success of marketing. The R&D capability of the enterprise reflects the process of using science, technology and knowledge to achieve customer satisfaction. The desire and needs of customers are realised through R&D capability of an enterprise embodies the process of using science, technology and knowledge to achieve customer satisfaction (Cohen and Levinthal 1989).

Emphasis on human resources, financial management, quality control and product production

The Resource Based View (RBV) perspective explores the resources which have characteristics i.e. valuable, rare, and inimitable, to create a competitive advantage. For the desired business outcomes, these capabilities need to be developed, nurture, and rewarded.

In the human resource system of enterprises, we should advocate the responsibility and market awareness of all staff to participate in product innovation, and establish an incentive system for product innovation in enterprises. The products that customers need are not only safe and reliable, but also in line with customer values, and strict quality control and production is a necessary part of product innovation.

The technological innovation of the company's products originates from demand, and the guiding principle of researching technology for application is clear. The first step is to have a clear understanding and definition of the problems to be solved in production and then to find ways, means or tools to solve them through the integration and improvement of existing technologies, or through further scientific research. The research results thus formed, due to the clear application objectives, can easily be applied within a short period of time, and will also be continuously improved and upgraded in the application, while solving the human application needs, but also promoting the development of science, technology and economy, society and human beings themselves. Foresight is the essence of technological innovation. In response to the characteristics and needs of the industry in which the enterprise is located, we should anticipate the further requirements of national policies for our industry and refine key technological issues as key R&D targets. You should also strengthen links with the government, industry and higher education institutions to complement each other's resources and form a virtuous cycle of independent research and development. There is great potential for technological innovation that combines the actual needs of enterprises and national development goals (Kamran et al. 2021).

- *Alibaba case - example for changing the manufacturing sector*

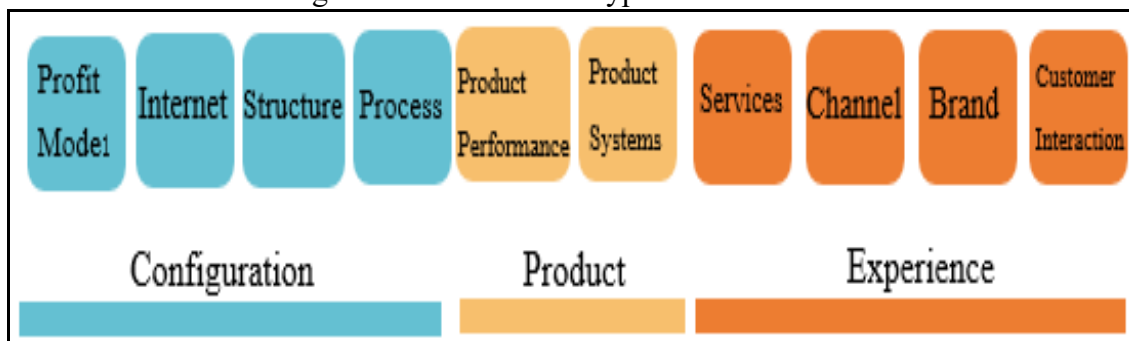
Alibaba is a Chinese multinational holding company in the e-commerce sector with business-to-business (B2B) - referring to a type of transaction that takes place between one business and another- or business-to-consumer (B2C) - as in a transaction that takes place between a business and an individual as the end customer- and consumer-to-consumer commerce (C2C) model -defined as one consumer selling goods or services to another consumer - open platforms. These platforms contribute to minimise costs by eliminating the complexity and building a more effective network. The transformation of Alibaba into a digital giant can be an example of the right combination of innovation and business strategy, where the company shifted its traditional commerce activity to online e-commerce using the radical advancement in digitalization. The success of Alibaba lies in creating a platform that hosted an innovation for creating a network effect of manufacturers, which transformed the Chinese retail system.

Alibaba manages organizational functions online by a data driven network of manufacturers, vendors, service providers and logistics organizations. Alibaba realized in China that was done by Amazon, eBay, PayPal, Google and FedEx in the USA. Most of the highest-valued online businesses, such as Amazon, Google and Facebook from the US, Alibaba and Tencent from China were established in the last few decades. As the case of Alibaba shows it is very important for the organization to develop an appropriate strategy and a related innovation strategy. A good strategy usually determines how each function, such as manufacturing, marketing, finance, or R&D supports the overall company strategy. The success of Alibaba comes from implementing what is called smart manufacturing as they automate as many processes as possible using the following: they record customer behavior; connect software solutions for each operation activity; share information by streaming; The Alibaba case can be used by managers as an example of a successful innovation strategy, which includes strategy, technology, quality and business model transformation (Lyu et al. 2020; Schmuck, Benke 2020).

4.3. Doblin Ten Types of Business Innovation from Company Aspects

Some data show that 95% of innovation initiatives by companies end in failure. Improving the success rate of innovation has become a universal issue for companies, and since 1998, Deblin & Co. has been working to find similarities and patterns between successful innovation cases with the hypothesis that they could find a periodic table of elements of innovation (Keeley 2013). The company collected around 2,000 best examples of innovation, including Ford's Model T car, Dell's direct sales model, Toyota's lean manufacturing and Gillette's throwaway razor, to name a few. The company analyzed and deconstructed these cases, using pattern recognition and complexity management techniques, and ultimately found that successful innovations were a combination of 10 basic types of innovation within 3 broad categories (see Figure 1). The study shows that the 10 types of innovation no longer confine innovation to products and technologies, but extend from business operations through to the entirety of the user experience. It reveals concrete ways to use this model to identify innovation opportunities and implement them into corporate action.

Figure 1. Doblin's Ten Types of Innovations



Source: Own edition based on (Keeley 2013).

The 10 types of innovation are not a flow chart, nor are they a ranking of the various types or a hierarchy involved. Any combination of forms can form an innovation and companies can start with any of the types. Combination of these 10 innovation types has been used very successfully in business. It is like the periodic table of innovation, where innovation strategies are like the chemical elements of the periodic table and any combination of strategies can be used to create a 'chemical reaction' to achieve a successful innovation.

There are three main types of innovation: configuration, product and experience. The first category focuses on the company's own operations and includes innovations in profitability, networks (joining others to create value), structure (organising and deploying talent and assets) and processes; the second category includes innovations in product performance and product systems; and the third covers innovations in services, channels, brands and customer interactions.

The left side of the framework focuses internally and away from the customer; as one moves to the right, the customer role of these innovation types becomes more and more apparent. It is like a theatre, where the left side of the theatre is backstage and the right side is frontstage.

The profit model (how to make money)

Innovation in the profit model is about finding a completely new way to turn a company's products, services and other sources of value into profit. Good profit model has to be based on a deep understanding of the user or consumer. A typical example is Gillette razors. The company sold razors at a very low price, attracted a large number of consumers and then made a profit with inexpensive replacement blades. This pioneering model was extremely successful and has since profoundly influenced countless industries and products. Examples include printers and ink cartridges, coffee machines and capsules, right up to today's mobile phones and mobile apps.

Networking (how to unite others to create value)

Network innovation provides a way for companies to leverage the processes, technologies, products, channels and brands of other companies, allowing them to leverage their own strengths while drawing on the capabilities and assets of other companies. There are various models of network innovation, which can range from alliances with allies to collaborations with powerful competitors. Franchising and crowdsourcing also fall into this category of innovation, and UPS and Toshiba have reached an agreement whereby technicians from UPS's logistics division help customers repair Toshiba laptops at the shipping hubs of the parcel service. This complementary collaboration saved Toshiba service time while generating a new revenue stream for UPS.

Structure (how talent and assets are organized and matched)

Structural innovation is about organizing corporate assets in a unique way to create value. It is either an excellent talent management system, or an original allocation of capital and equipment, or it can be an improvement in the fixed costs and departmental functions of the business, including improvements to the human resources department, R&D and IT departments. Ideally, these innovations can lead to a productive environment or achieve efficiencies that outperform competitors, attract talent to the business and so on. Whole Foods in the USA is known for its radically decentralised approach to management. Each of the company's shops is managed autonomously by a team of employees at the shop. On the company's income statement, each shop is autonomous and self-sustaining, and each team has very clear performance indicators.

Processes (how to run a business using a unique or superior approach)

Process innovation requires a dramatic change from the norm that enables a business to leverage unique capabilities, function efficiently, adapt quickly and create market-leading levels of profitability. Process innovation often results in a company's core competencies and may include proprietary and patented methods that give a company a huge advantage over years or even decades. Toyota's lean manufacturing system is typical, as is Zara's ability to bring designers closer to their markets and shorten the time to market by effectively

integrating design, production, logistics and distribution systems to maximize stock turnover and give designers the ability to react quickly to changes in fashion trends.

Product performance (how to develop products with distinctive features and functions)

Product performance innovation refers to innovating the value, characteristics and quality of the products or services offered by a company. Such innovations result in completely new products or significant extensions to existing product lines. It is often incorrectly assumed that product expression innovation is all there is to innovation, but in fact it is only one of 10 types of innovation and is the type most likely to be copied by competitors.

Product systems (how to create complementary products and services)

Product systems innovation is about how individual products and services can be connected or combined to form powerful and scalable systems. It unites otherwise distinctly different products and services through interoperability, modularity, integration and other ways of creating value. Product system innovation can help you build ecosystems that stick to your customers and can withstand competition. The non-profit organisation Mozilla is widely known for its development of the Firefox browser. Firefox is an open source software that allows independent developers to create hundreds of independent plug-in programs. Firefox has over 450 million users worldwide.

Services (how they support and enhance the value of the product)

Service innovation ensures and enhances the utility, performance and performance value of a product. Service innovation makes a product easier to use. It demonstrates product features and functions that customers can ignore and solves problems they encounter during use. Excellent service innovation brings an engaging user experience to a bland product, leading to more business. During the financial crisis in 2009, Hyundai launched an 'insurance' program whereby customers who bought or leased new Hyundai cars could return them to the company without being liable for repayment if they lost their jobs within a year of purchase. This has greatly increased consumer confidence in Hyundai and has helped Hyundai's performance rise against the financial crisis.

Channels (how products and services delivered to customers and users)

Channel innovation involves all the ways in which companies deliver their products and services to users. The goal of such innovation is to ensure that users can buy what they need at any desired time, in any desired way, while enjoying maximum convenience, low cost and pleasure. Web on Demand on the Amazon Kindle is a service that customers can try for free via the internal wireless network. Users can purchase and download e-books and start reading them in less than 60 seconds.

Branding (how products and businesses presented)

Branding innovation helps ensure that users recognise, remember and favour your products and services over competitors or alternatives. Intel's 'Intel Inside' branding has dramatically improved the recognition of processors. Any product with this mark adds value to the user's perception.

Customer interaction (how to foster engaging interactions)

Customer interaction innovation is about understanding the deeper needs of the customer and using these insights to develop the relationship between the customer and the company. ". In order to secure status and recognition, consumers are motivated to compete and many businesses are competing for customer patronage. Browse the shelves of any major supermarket and you'll see that most companies' innovation strategies are nothing more than

product morphing and line extensions – For example if you add some pink Hawaiian sea salt, crisps you can sell better. Another impressive example if you add the smell of lavender to laundry detergent, it will be more appealing to consumers. The proliferation of such 'innovations' is due to the fact that companies don't need to make any changes to their production processes, so why not?

The problem is that, as an innovation strategy, pure product innovation is almost useless. Today, almost all product categories are in fierce competition, and suppliers will only succeed if they can offer a product or solution with unique features to all market players, rather than selling to just one company. In other words, any unique advantages of any new product will be quickly swallowed up.

Nowadays, whether you are in the textile industry or the technology industry, almost any product design can be cracked in the shortest possible time. A new product hits the market and soon afterwards, imitations appear. Looking back at the successful innovations in history, it is easy to see that there are other brilliant ideas hidden behind great products. The Ford Model T, for example, was made possible by Ford's eight-hour work week and high wages, and the rapid rise in the income of the American middle class has created a large potential user base (Welles 2007). Starbucks was never intended to be a coffee chain, but rather a 'third space' for consumers outside of their homes and offices. Currently, Starbucks Corporation is a roaster, marketer and retailer of specialty coffee on global scale. The pivotal role of creativity to Starbucks is to focus on individuals, the organization, and creating new ways of thinking and implementing numerous innovation in the global coffee industry, taking into consideration challenges related to ethics and responsibilities within many aspects due to its system theory (Kee et al. 2021; Lemus et al. 2015).

In these cases highlighted that combining multiple types of innovation helped the company to have better financial returns. Although the performance of these companies cannot be attributed entirely to innovation, it helps to improve the mechanics of a company, including the expectations of investors for its future. So is it true that the more types of innovation a company uses, the better? This requires firms to apply innovation type 10 according to the direction set (Bruin and Shaw 2011).

In determining which types of innovation can be applied, it is important to determine the direction of innovation. When you look at the innovation activities of other companies, you should keep in mind one or more of three cornerstones: business model, platform or customer experience. Understanding these ones, you will give deeper insight into what you and your competitors are doing in the marketplace, and you will be able to determine whether you should make a conscious effort to double down on your existing projects or go in a different direction after clarifying two issues:

- *What are the drivers of innovation in your industry?* In most industries, the driving force of innovations focused on a variety of products. Whatever you and your competitors are doing, start by reflecting on,
- *What can we do differently?* If others are focusing their innovation on products and service providers, can you find another way to do so in terms of a profitable model? Secondly, what types of innovation are key? Imagine if you took away any of these innovations, would your business collapse? It's just an old-fashioned car rental company. So the key for Zipcar was to change its business model.

Transform the business model - this innovation focuses first on deploying assets, capabilities and other elements of the value chain in order to serve customers in a differentiated and profitable way. Even companies that primarily sell hardware equipment, such as General Electric and Johnson Controls, have found that a pay-per-volume equipment rental model can generate real value. Business model transformation starts on the left side of the framework (including profitability, network, structure and process innovation) and then keeps moving to the right, adding the complementary items you need to add to the business model.

An innovative business model can be successful in any situation, but it is particularly effective in the following areas: asset-intensive industries such as the automotive industry, heavy industry and highly regulated industries such as healthcare and aerospace.

Transforming platforms - Companies often focus on its products and constantly add features or functionality to them with few other measures. Platform-driven innovation focuses on repurposing, recombining or discovering new relationships with capabilities, products and services to deliver new value to customers. Developing this new platform model starts in the middle of the framework (including process, product performance, product-system and service innovation), integrates these types of innovation to create a solid foundation, and then continues to extend to the ends of the framework, adding other types of innovation to help make your platform work. Platform innovation is most productive when you identify new opportunities to help your customers solve their challenges by connecting different groups, capabilities and products. When you find that your customers are having difficulty integrating products or services and need to reduce the complexity of their work, you need to consider whether it is time to build a new platform.

Transform the customer experience - This innovation starts with connecting, serving and engaging customers in unique ways that change how they interact with the business and its products. This transformation starts on the right side of the framework (including channels, brands and customer interactions). Then move to the left to add new types of innovation to make the customer experience work.

When a category is too competitive, too old-fashioned or too complex, providing a superior user experience is essential. User Experience (UX) innovation is a natural extension of that desire to create new things and make life easier and it can be particularly important when dealing with a highly connected customer base, as any good or bad news about the customer experience can spread like wildfire. UX solutions means combination involvement of the user (e.g. predispositions, expectations, needs, motivation, and mood), the designed system (e.g. complexity, purpose, usability, and functionality) and the context or the environment within which the interaction takes place. UX innovation is applicable to any industry, even in the old-fashioned B2B sector (Berni and Borgianni 2021; Saha 2007; Sun and Teng 2017). Once we have found the main direction of innovation, we need to determine the scale of the innovation and the resources required. You can classify the scale of innovation into 3 levels: change the known, change the boundaries and change the rules of the game. The greater the scale of innovation, the greater the resources required and the degree of risk it entails, so the greater the variety of innovation is not the better. Companies should find the right scale of innovation for them and strike the right balance between the number of innovations and their ability to innovate in order to increase the success rate of innovation. In this context, the below Table 4. shows the levels of innovations.

Table 4. Innovation levels

Level	Description
<p>Level 1: Core innovation - changing the known.</p>	<p>By improving an existing product, a company can offer its customers better quality, performance and experience. This scale of innovation requires only 2-3 types of innovation. The advantage from this type of innovation does not last long, as competitors are quick to imitate and respond in a targeted manner. This is why new market entrants rarely succeed with core innovations, as they fail to create sufficient differentiation and are quickly countered by existing competitors. Core innovation will work best for you if you are already a leader in your industry</p>
<p>Level 2: Extended innovation - changing boundaries</p>	<p>When offering a new integrated solution to customers, companies often need to reconfigure existing products in order to contrast with those of their competitors. This level of innovation often brings new customers to the market and changes market participants' expectations of the product. Extended innovation requires more boldness than core innovation, and it often requires the inclusion of 3-4 innovation types. Companies that successfully innovate by extension usually change the way they work, alter existing capabilities or develop entirely new ones. This makes extended innovation more risky than core innovation, but it also makes the innovation more difficult to emulate. Such innovations can generate significant competitive advantages for the company</p>
<p>Level 3: Transformational innovation - a game changer</p>	<p>In extremely rare cases, you may choose to challenge and disrupt everything. This innovation will fundamentally change the structure of the entire industry. With no less than five types of innovation of this kind, completely new businesses (and not just products or services) will be born. Such innovations often disrupt existing market norms and nullify the advantages of market pioneers. In today's ever-changing business environment, every business should be prepared for this type of innovation. Innovation through change is the riskiest form of innovation, it requires the most thought and determination, and it can also yield the highest rewards</p>

Source: Own edition based on (Saha 2007; Sun and Teng 2017).

Having identified the direction and level of innovation that suits your company and the environment in which you operate, you can begin your own innovation journey. Innovation Type 10 as a practical tool that can help diagnose and enrich the innovation being practised by your company or help you analyze the existing competitive landscape, it can reveal gaps or identify potential opportunities to achieve a difference or even disrupt the market.

5. Impacts of innovation on business performance

In today's ever-changing world, the only constant is "change". The only way to cope with change is to be innovative, so that enterprises can seek long-term development. Today is the era of knowledge economy, network economy and information economy, innovation for development has become the way to enterprise development, and the speed of change is getting faster and faster. For companies, innovation is not an idea that is fantastic in the laboratory and a flop in the marketplace, but an idea that can be turned into revenue and profit. Straightforward innovation should be able to change the context in which the company finds itself, including all aspects of the market, customers, competition and society.

Innovation closely linked to the development of a company. The development of a firm is a cyclical process in line with life-cycle theory, typically going through a period of entrepreneurship, growth, maturity and decline, and changes in a firm's ability to innovate usually precede changes in the economic state of the firm by one phase. In the early start-up phase, innovation is the priority of the established enterprise to exploit this opportunity. In the growth phase, the focus of enterprise development is on system design, the selection of new fields and industrial diversification, which are the concrete expression of institutional and technological innovation, and structural innovation. After the initial innovation and accumulation, the enterprise enters the peak state of its life cycle, i.e. the maturity period, and gradually achieves relative competitive advantages in production technology, product quality and sales channels, and enhancing its ability to resist market risks. After entering the recession period, the economic business of the enterprise comes to a halt and declines, directly or indirectly reflecting the problems of the enterprise's innovation ability. If enterprises want to win in future business competition, they must pay great attention to the changes in their innovation ability and gradually strengthen their own innovation ability.

Some examples

- *Tesla makes good use of multi-modal innovation*

Few companies succeed in innovating across all ten types, but one of the most benchmarked examples to study is Tesla (Furr and Dyer 2020). They clearly operate in the incredibly competitive automotive and energy industries, often with razor-thin margins and high barriers to entry, so they have exceeded almost everyone's expectations just by being able to get to where they are today. To get there, they had to do lot of different types of innovation. Starting with configuration innovation, their biggest focus has been to rethink the ecological networks, structures and processes traditionally used in the automotive industry. Tesla abandoned its dealer network to focus on vertical integration to eliminate complexity and overhead in the supply chain, and made many process innovations to make its prices comparable to comparable internal combustion engine cars to sell online. Pioneered software updates to their vehicles in the industry to help them develop and test their self-driving software as efficiently as possible. In terms of 'profit model innovation', they pioneered the pre-order model to help fund the development of their upcoming vehicles and give shareholders confidence in the future of the company. On a 'product innovation' related note, Tesla has clearly made hundreds of incremental innovations over the years to improve their products beyond the status quo on a wide range of performance metrics including price, driving range, acceleration, safety and infotainment system features. They have also provided customers with products that complement the car, such as a network of charging posts and home solar and energy storage. Combined, all of these innovations make the experience of using and owning a Tesla vehicle so rich that Tesla customers are very happy with their vehicles.

In the area of 'experience innovation', Tesla has also made many innovations. For example, they were the first car manufacturer to actually buy a car online, open their own shops and allow you to return a car if you are not satisfied with it after 7 days of purchase. They also have a fleet of mobile service vehicles that allow you to have your car serviced at your location without having to take it to the nearest service station. They have clearly invested a lot of time and effort in keeping their values and mission transparent, which, combined with their pioneering products, has created a very strong brand and community for them, by working on both fronts. Now they are starting the energy business (<https://www.163.com/dy/article/I132AVQM0521C9T8.html>).

- *Multiple Innovation Story of Google*

It is also due to innovation that has made Google the number one search engine to become the giant of the Internet, making a small company in less than 20 years after its establishment, with such a scale and influence. It is innovation, or innovation, which has changed the landscape of the Internet world. As one of the most innovative and technologically advanced companies in the world, Google has world-leading technological advantages and application advantages in areas such as artificial intelligence, autonomous driving and cloud computing. Google's technological and scale advantages will drive the global technological revolution bringing more convenience and change to humanity countries (Hussein 2020; <https://www.braineet.com/blog/google-innovation-culture>).

Google has always been a leader in the field of artificial intelligence, whether in machine learning, natural language processing or image recognition, Google is at the forefront of technology. In recent years, Google has also launched a range of AI products and services, such as Google Assistant and Google Home, making AI and smart homes increasingly popular.

Besides that, Google got significant technological benefits in autonomous driving. Google's Waymo is one of the world's leading self-driving technology companies, with its self-driving cars already being tested in several cities. Waymo is actively developing new technologies, such as LiDAR sensors and driverless all-electric trucks, to enable safer and more efficient self-driving modes, and to expand them to more scenarios and countries (Clausen and Olteneau (2021).

Google Cloud is one of the world's leading cloud computing technology providers, and it is tied with AWS and Microsoft Azure as one of the three cloud computing giants. In recent years, Google Cloud has continued to accelerate the construction of data centres and network infrastructure around the world to meet the growing needs of customers in various industries. In addition, Google Cloud has also launched a series of solutions in the military, healthcare and government sectors to provide customers with more comprehensive and precise cloud computing services (<https://www.thecasesolutions.com/innovation-at-google-61572>).

Summary and conclusions

Throughout contemporary business, the only way to be proactive and invincible in the competition is to be innovate.

Innovation not only maximizes the economic efficiency of a company, but also improves its position in the competitive marketplace. Excellent innovators are able to break through the growth points of new technologies in the industry, open up new product market spaces, establishing efficient sales networks and brand values. Innovation fosters a company's sense of creativity and innovation, improves operational management capabilities and legally establishes executive relationships for companies to stay ahead in global competition

Enterprise innovation can be divided into two categories according to its content, one is product innovation and the other is process innovation. Product innovation refers to an enterprise providing a certain new product or service to distinguish itself from competitors' products to attract consumers, occupy the market and earn profits. On the other hand, process innovation refers to an enterprise adopting a new or significantly improved production method to produce and transmit products or services to improve labor productivity, enhance product quality and reduce costs, thereby achieving the maximum benefit from the enterprise's output.

Although process innovation and product innovation are different ways of innovating and in different ways, they both aim to improve the economic efficiency of the enterprise. Product innovation focuses on the results of activities while process innovation focuses on the process of activities. The results of product innovation mainly manifest in the material form of products, while the results of process innovation can reshape various factors of productivity.

In practice, enterprises need to carry out in-depth research by analyzing their intrinsic characteristics and external market trends, combined with innovation types, in order to develop more scientific and forward-looking innovation strategies that will provide strong support for their long-term development.

In addition, while a defensive product strategy is negatively impact on any firm's patent activity, an offensive strategy can contribute to increasing its market share in China. Innovation policy and total R&D investment drive a firm to sell more products overseas and increase its new product sales across the globe. Local talent market can also help improve a firm's patent application but often drive the firm to focus more on domestic markets (Zhenzhong and Quan 2019).

The study pointed out that product innovation enables companies to improve their performance, not only helping them to enhance their product innovation capabilities, but also helping them to improve their market competitiveness, which can provide certain insights for their long-term stable development.

Innovation is a critical capability for companies to adapt to the changing external environment and ensure their survival and growth.

The ever-changing external environment brings new opportunities and challenges to enterprises. Increasing number of governmental and social policies and regulations requiring the production of environmentally friendly products opens up new ways of doing business and closes the door on old ways of doing business. New changes in social and economic areas emerge such as people's beliefs, expectations, desires and income require companies to constantly develop new products and eliminate obsolete ones. Developments in S&T drive companies to generate new ideas to meet the growing demands of society. New products launched by competitors may also pose a major threat to an enterprise's established market position. Only with the ability to be innovate can an enterprise respond quickly to dynamic changes and ensure its survival and stable growth.

Innovation is the most important source of sustainable competitive advantage for firms.

While factors such as firm size and assets are also sources of competitive advantage, in today's competitive landscape, firms that are able to use their knowledge, skills and experience to develop new products, services and processes better positioned to do so. Studies have shown that there is a strong correlation between new products and market performance. The contribution of innovation to a firm's competitive advantage can be seen in different ways. New products can help firms capture and maintain market share and increase their profitability in the marketplace. Mature products cannot grow sales in a competitive market solely on the basis of low prices, and non-price factors such as design, product customization and quality play a very important role in this process. In today's increasingly shortened product lifecycles, the ability to replace products with better ones is becoming increasingly important. The so-called "time competition" suggests that companies are not only under pressure to launch new products, but to do so faster than their competitors.

Continuous innovation is a fundamental guarantee of maintaining a company's competitive advantage.

The advantage gained from innovation will fade as other firms try to imitate it. A company that imitates an innovation will take the initiative to change its product (service), business process or underlying business model in time to gain the advantage of being the "late comer". Only through continuous innovation can a company maintain a competitive advantage that is difficult to surpass in the marketplace. From another point of view, only by upgrading from imitation innovation to original innovation and independent innovation, and by cultivating their own capacity for continuous innovation, can companies outperform their competitors and gain a real competitive advantage in the strong market competition.

REFERENCES

Publications, studies:

- Adner, R. and D. Levinthal (2001): "Demand Heterogeneity and Technology Evolution: Implications for Product and Process Innovation." *Management Science* 47.5:611-628
<https://doi.org/10.1287/mnsc.47.5.611.10482>
- Atsushi, A. (2013): "Where is Abernathy and Utterback Model?"; *Annals of Business Administrative Science* 12.5:225-236 <https://doi.org/10.7880/abas.12.225>
- Bacchiega, E., L. Lambertini and A. Mantovani (2010): "On MQS regulation, innovation and market coverage." *Economics Letters* 108.1:26-27
<https://doi.org/10.1016/j.econlet.2010.04.001>
- Berni A. and Borgianni Y. (2021): From the Definition of User Experience to a Framework to Classify its Application in Design; *Proceedings of the Design Society* 1:1627-1636; doi: 10.1017/pds.2021.424; License: CC BY-NC-ND 4.0
<https://doi.org/10.1017/pds.2021.424>
- Bruin A. and Shaw E. (2011). *Social Innovation and Social Entrepreneurship: Extending Theory, Integrating Practice*; *International Small Business Journal Researching Entrepreneurship* 29(1):3-3; doi: 10.1177/02662426110290010101
<https://doi.org/10.1177/02662426110290010101>
- Chang, S. et al. (2021): "Managerial strategies for process innovation through the perspective of competition among supply chain members." *Journal of Cleaner Production* 296.7:126532 <https://doi.org/10.1016/j.jclepro.2021.126532>
- Christien Enzing (2009): "Product innovation in the Dutch food and beverage industry" , Wageningen Academic Publishers <https://doi.org/10.3920/978-90-8686-678-6>
- Clausen J.& Olteneau Y. (2021): *New players in the automotive industry: Waymo, Build Your Dreams and Sono Motors*; Borderstep Institute for Innovation and Sustainability; doi: 10.13140/RG.2.2.22228.07049
- Cohen W. M., & Levinthal, D. A. (1989). *Innovation and Learning: The Two Faces of R & D*. *The Economic Journal*, 99(397), 569–596. doi: <https://doi.org/10.2307/2233763>
<https://doi.org/10.2307/2233763>
- Cooper R.G., and Kleinschmidt E.J. (2016): "Benchmarking the Firm's Critical Success Factors in New Product Development." *Journal of Product Innovation Management*
- Darroch J. and Miles P. M. (2015): *Sources of Innovation*; In Book: *Wiley Encyclopedia of Management*; doi: 10.1002/9781118785317.weom130014
<https://doi.org/10.1002/9781118785317.weom130014>
- Drucker F. P. (2002): *The Discipline of Innovation*; *Harvard Business Review*; <https://hbr.org/2002/08/the-discipline-of-innovation>

- Filson, D. (2002): "Product and process innovations in the life cycle of an industry." *Journal of Economic Behavior & Organization* 49. 1:97-112 [https://doi.org/10.1016/S0167-2681\(02\)00060-4](https://doi.org/10.1016/S0167-2681(02)00060-4)
- Fu, J.J. (1998): *Technological Innovation*. Tsinghua University Press, Beijing, 97
- Guo, Bin, and Wang, Duanxu (2003): "Employee performance evaluation in R&D departments of high technology companies." *Science Research Management* 24.2: 6.
- Gu, Q. and Y. Zhang (2019): "Dynamic analysis of the impact of employee training investment on closed-loop logistics." *International Journal of Modelling in Operations Management* 7.4:318 <https://doi.org/10.1504/IJMOM.2019.106889>
- Hong Cheng, Dandan Li, Lianfa Luo. (2014): "The Chinese perception of quality: model building and analysis based on consumers' perception", *Journal of Chinese Management* <https://doi.org/10.1186/s40527-014-0003-7>
- Hospers J-G. (2005): Joseph Schumpeter and his legacy in innovation studies; *Knowledge, Technology, and Policy* 18(3):20-37; doi: 10.1007/s12130-005-1003-1 <https://doi.org/10.1007/s12130-005-1003-1>
- Hu and Junyan (2010): "[IEEE 2010 International Conference on Management and Service Science (MASS 2010) - Wuhan, China (2010.08.24-2010.08.26)] 2010 International Conference on Management and Service Science - The Determinants of Sourcing by Multinationals in China." <https://doi.org/10.1109/ICMSS.2010.5577490>
- Kamran Hameed, Noman Arshed, Naveed Yazdani, Mubbasher Munir (2021): *Motivating business towards innovation: A panel data study using dynamic capability framework; Technology in Society*, Volume 65,ISSN 0160-791X, doi: <https://doi.org/10.1016/j.techsoc.2021.101581> ; <https://www.sciencedirect.com/science/article/pii/S0160791X21000567> <https://doi.org/10.1016/j.techsoc.2021.101581>
- Kee H.M. D; Hidayah N., Syamilah H; Nasuhah N.N.; Sysasya H. Norathirah W. (2021): *How Starbucks Maintain Its Competitive Edge? – The Secret of Its Success; Journal of The Community Development in Asia* 4(2):34-43; doi: 10.32535/jcda.v4i2.1078 <https://doi.org/10.32535/jcda.v4i2.1078>
- Keeley, L. (2013): "Ten types of innovation"; Publisher: Wiley & Sons
- Klepper, S. (1996): "Entry, Exit, Growth, and Innovation Over the Product Life Cycle." *American Economic Review* 86.3:562-583
- Lemus E., Feigenblat O.F., Orta M. and Rvivero O. (2015): *Starbucks Corporation: Leading Innovation in the 21st Century; Journal of Alternative Perspectives in the Social Sciences*, Volume 7 No1,23-38;
- Li Yanhui (2010): "Building the core competitiveness of Chinese auto parts enterprises." *Modern Parts* 11:66-69. <https://doi.org/10.1016/j.rcim.2020.101932>

- Luca, et al. (1998): "Product homogeneity as a prisoner's dilemma in a duopoly with R&D." *Economics Letters*
- Lyu Z, Lin P, Guo D, Huang GQ. Towards Zero-Warehousing Smart Manufacturing from Zero-Inventory Just-In-Time Production. *Robotics and Computer-Integrated Manufacturing* 2020;64:101932 DOI: 10.1016/j.rcim.2020.101932
- Muhammad Iqbal and Amalia Suzianti (2021): New Product Development Process Design for Small and Medium Enterprises: A Systematic Literature Review from the Perspective of Open Innovation; *J. Open Innov. Technol. Mark. Complex.* 7(2), 153; <https://doi.org/10.3390/joitmc7020153> <https://doi.org/10.3390/joitmc7020153>
- OECD (2018): Oslo Manual. Guidelines for collecting, reporting and using data on innovation; 4th Edition; <https://www.oecd.org/science/oslo-manual-2018-9789264304604-en.htm>
- Porter, M. (2010): "Competitive Advantage of Nations." *Competitive Intelligence Review* 1.1:14-14. <https://doi.org/10.1002/cir.3880010112>
- Rahaman, Mna and M. R. Muhamad (2004): "The winning new product strategy: Market or technology driven?." *Engineering Management Conference, 2004. Proceedings. 2004 IEEE International IEEE*
- Saha, S. (2007). "Consumer Preferences and Product and Process R&D." *The RAND Journal of Economics* 38 (1):250–68. <https://doi.org/10.1111/j.1756-2171.2007.tb00054.x>
- Schmuck R., Benke M. (2020): An overview of innovation strategies and the case of Alibaba; *Procedia Manufacturing* (51):1259–1266, DOI: 10.1016/j.promfg.2020.10.176; Licence: CC BY-NC-ND <https://doi.org/10.1016/j.promfg.2020.10.176>
- Sledzik K. (2013): Schumpeter's view on innovation and entrepreneurship; *SSRN Electronic Journal*; pp.89-95; Online ISSN: 1556-5068; doi: 10.2139/ssrn.2257783 <https://doi.org/10.2139/ssrn.2257783>
- Slomp, J., D. Krushinsky and R. Caprihan (2011): "The 19th International Conference on Industrial Engineering and Engineering Management." (IEEE)
- Sun, S. and Teng, L. (2017), "Establishing China's First UX Master Program Based on Applied Psychology Perspective", in Marcus, A. and Wang, W. (Eds.), *Design, User Experience, and Usability: Theory, Methodology, and Management*, Springer International Publishing, Cham, pp. 767–775. https://doi.org/10.1007/978-3-319-58634-2_55
- Yang, D. and W. J. Zhong (2010): "Systematic Probe into Dynamic Factors to Promote Enterprises Self-directed Technological Innovation." *International Conference on Information Management, Innovation Management & Industrial Engineering (IEEE)*
- Zhenzhong Ma & Quan Jin (2019): Success Factors for Product Innovation in China's Manufacturing Sector: Strategic Choice and Environment Constraints; *International Studies of Management & Organization*; 49:2, 213-231; DOI: 10.1080/00208825.2019.1608397 <https://doi.org/10.1080/00208825.2019.1608397>

Ziemnowicz C. (2013). Joseph A. Schumpeter and Innovation; In book: Encyclopedia of Creativism Invention, Innovation and Entrepreneurship; doi: 10.1007/978-1-4614-3858-8_476 https://doi.org/10.1007/978-1-4614-3858-8_476

Utterback J. & Afuah A. (1998). "The Dynamic 'Diamond': A Technological Innovation Perspective," Economics of Innovation and New Technology, Taylor & Francis Journals, vol. 6(2-3), pages 183-200.; doi: 10.1080/10438599800000019 <https://doi.org/10.1080/10438599800000019>

Welles W. C. (2007): The Road to the Model T: Culture, Road Conditions, and Innovation at the Dawn of the American Motor Age; Technology and Culture 48(3); doi: 10.1353/tech.2007.0142 <https://doi.org/10.1353/tech.2007.0142>

Internet sources:

digitalcommons.ursinus.edu; access on October 15, 2023

<https://www.braineet.com/blog/google-innovation-culture>; access on October 10, 2023

<https://www.163.com/dy/article/I132AVQM0521C9T8.html>; access on on October 10, 2023

<https://www.thecasesolutions.com/innovation-at-google-61572>; access on on October 12, 2023

Eschberger-Friedl T. (2021). Dominant Design and its impact on innovation; Led Innovation; <https://www.lead-innovation.com/en/insights/english-blog/dominant-design-and-its-impact-on-innovation>; access on January 22, 2024

Hussein Al Ahmad (2020)_ Google's Case of Innovation; what evidences are there?; https://www.academia.edu/4432432/Google_s_Case_of_Innovation_what_evidences_are_there; access on October 12, 2023

Mahoney M. (2010). The Evolution of Innovation. How companies develop new products and how the companies themselves develop in the process. MIT Technology Review; <https://www.technologyreview.com/2010/02/23/205459/the-evolution-of-innovation/>, access on January 22, 2024.

MBA Knowledge Base (2023): Discontinuous Improvement – Abernathy and Utterback Model; <https://www.mbaknol.com/modern-management-concepts/discontinuous-improvement-abernathy-and-utterback-model/>; access on January 22, 2024

Nathan Furr and Jeff Dyer (2020): Lessons from Tesla's Approach to Innovation; <https://hbr.org/2020/02/lessons-from-teslas-approach-to-innovation>; access on October 14, 2023

www.highprobiotics.com; access on October 15, 2023