The Analysis Based on Evolution of the Computer Industry

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Abstract

Human innovation is the basis of human survival and development, and scientific and technological innovation are the precursors of industrial evolution. What is the role of cognition in innovative activity? What are the characteristics of the process of its development in a creative environment? This paper proposes the internal mechanism of class creation as an innovative activity from the point of view of industrial evolution and argues that class creation occurs on the basis of cognition. Taking the history of the computer industry as an example, the paper analyses the position of class creation in the process of technological innovation and discusses the role of cognitive activities in the innovation process. It is pointed out that various class-creation activities are the important reasons that drive the evolution of the computer industry.

Keywords

cognition, innovation, similar creation, computer industry

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0. Introduction

Innovation, as a combination of technology and economy, reflects the creation, transformation and application of knowledge in the industrial and commercial application of new technologies, and is the most important source of motivation for industrial restructuring and continuous upgrading. However, the internal mechanism of innovation as a creative human activity and the role of this mecha-

nism in driving industrial evolution is rarely discussed. It is well known that human creative activity is a prerequisite for the transformation and application of knowledge and is a key element of research and development. In this paper, we will explore a model of individual cognitive activity, a particular model of knowledge creation - similar creation - and its role in the evolution of the computer industry.

1. Cognition, similar creation and real creation

Creating is an inspiring word, and the process of technological innovation is full of creative activities. Creating, as an activity and phenomenon that creates a finished product for the final industry, requires both originality and originality, i. e. Real creating. The innovation activity of a company is based on the movement of real creation in the first place. However, from the viewpoint of the evolutionary history of the computer industry, the innovative activity of the enterprise not only includes real creation, but also includes another kind of creation, which is not the first product in the history of human beings and in the evolution of the industry history, but is creative only in terms of individual (enterprise) history, and this kind of creation is called Similar creating. The difference between the two types of knowledge creation is measured by the development of the product in the history of mankind, industry and business. True creation and similar creation are both innovative elements that play an important role in the development of computer upgrading industry. Are the thinking or cognitive abilities they exhibit in creation and innovation activities essentially the same? Is there a difference in the cognitive psychology based on the class creation and true creation? In this paper, the history of the computer industry will be discussed.

The history of the computer industry is considered to be the process of continuous improvement of mechanisms for serving customers, which is manifested in the introduction of new elements and components of technological changes in products at the most appropriate time to meet not only the requirements of current customers but, more importantly, the requirements of new customers (whose needs are not met by the functions of old computers) through new designs of computers. Creative activity is particularly evident in the growth of new companies that are new to the industry, and they are always the

first to enter new markets that are risky.

The use of cognitive psychology to distinguish between real and similar creation has important theoretical and practical implications, in terms of individual creativity, for understanding why there is so much creative activity and creative talent in the computer industry, and why the evolution of the computer industry rests on the ability to innovate not only in the rarer real creation, but also in the more common and widespread similar creations. As psychologist J. P. GUILFORD put it, "one of the most meaningful insights that has been gained so far is that creativity no longer has to be assumed to be limited to a few geniuses; it is potentially distributed throughout the population." In terms of industrial evolution, each step in the evolution of computing is composed of real creative and creative-like activities, reflecting in a tangible way the advantageous character of the computer industry with its abundant human resources.

The evolution of the computer industry can be roughly divided into four eras: the first era is the era of large computers, the second era is the era of the introduction of integrated circuits and the development of microprocessors, the third era belongs to the personal computer, PC era, and is currently in the fourth era of the network era of personal computers, that is, a large increase in the number of Internet users. The changes in the four eras fully reflect certain essential features of innovative activity, namely, the solution of the problem of business strategy and product renewal of computer enterprises through similar creation and real creation, because, from the point of view of psychological mechanisms, it is entirely possible to consider creation as a special problem-solving activity.

2. The evolution of computers - the history of formatting

During and after World War II, governments in Europe and the United States began to develop the computer industry with the primary purpose of serving the government. in the late 1940s and early 1950s, a number of companies hoped to attract organizations that had a need to perform large-scale computing, such as large scientific laboratories, large corporate companies, and so on. IBM, for example, entered the computer field in the early 1950's. As a manufacturer of

punch cards and tabulating machines, IBM also had a strong electronic computing capability that allowed it to secure research and development contracts from the government. Other American contemporaries such as Burrows, Univac Rand, Honeywell, and General Electric were already pursuing their own different business strategies in the computer market and succeeding in making profitable sales. IBM started to be ahead of the companies due to the introduction of 650 in 1954 and the introduction of 1401 in 1960 gave it the dominant position in the computer market. It is clear that the introduction of new technology was the winning formula for IBM's victory in the first era.

The second era was sufficient for improvements in component technology, and basic circuitry became its hallmark as a vacuum tube replacement. Investment in and development of integrated circuits not only led to greater improvements in the computing power of mainframe computers, but also made it possible to design more capable and less costly computers. DEC's 1965 PDP8 marked the creation of the first generation of microcomputers, creating a new class of demand from medium-sized laboratories, manufacturing companies, and some small companies, a group of organizations without large computing needs.

In the microprocessor era, a new group of companies entered the personal computer market by designing and producing superior computers, such as Apple, Commodore, Tandy, and Compacorp. An important feature of these companies was that the vast majority of the components in their products were purchased on the open market, while the software was designed by specialists. This was in contrast to the large computer companies, such as IBM, which in the early days designed and manufactured most of the components, but also designed most of the software. From its inception, the microprocessor era has been characterized by more vertical specialization accompanying similar-creation activities than the mainframe computer era, and this has become even more pronounced in the personal computer era.

The above characteristics of technology and markets continue to develop in the new era of personal computer networks and the Internet. Specialized companies compete at different levels of the market (e. g. microprocessors, computer components, printers, computer desktops, operating software, application software, etc.) on the one hand, and are linked to each other through open standardization and compatibility on the other, which makes the similar-creation activities of firms not only possible but inevitable. With the distinction

between technology-leading and market-leading companies in the industry, the introduction of new technologies and the entry of new markets is even more important. Dominant firms generally emerge in the early history of the industry, and these firms, which have not yet established themselves, start out by capturing a particular area of the market through technological development (a large number of which are similar-creation activities) and then persist in the face of intense competition.

3. Cognitive processes and customer threshold requirements for similar creation activities

The customer's needs point the way to the cognitive process of similar creation. A potential buyer of a computer evaluates it in two ways, one is its functionality and the other is its price, in fact any evaluation of a computer is a comparison of the proportion of these two dimensions in its quality range. There are two separated groups of potential customers in the sales market. One group is large corporate enterprises, who mainly value the powerful computing capabilities of computers and buy large computers; the other group is individual or small user groups, who are less demanding in terms of computer features and more interested in the price of computers, and they are the potential market for personal computers. Each group has a minimum level of requirements regarding computer features and price before purchasing a computer i. e. threshold requirements, once the threshold requirements are met, they ask for more powerful features and lower prices, and it is these customer threshold requirements that drive computer innovation activities. In terms of real creation, it was first the single component technology, the electron tube transistor technology, which ensured the creation of the computer, then the creation of the new component technology, the microprocessor, but it was the large similar of creative activity that continued to drive the development of the product to make it a commodity.

Once a basic technology is created (real creation), countless companies adopt and modify it to give it new qualities and functions. For example, microprocessors are better than transistors, both in terms of performance and price, especially in terms of price range. But this technological potentiality resulting from real-creation activity could not have become a market reality

without the transfer of knowledge, the cognitive process of the technologist, and the various imitative and experiential learning that applies its massive modifications to various computer designs and to various problem solving.

The above discussion not only shows the industrial history profile and points out certain dynamic rules of industrial development, but also encompasses the perception of the individual through the perception of the truly created product and the existing market, which leads to similar creation - continuously improving the design until the threshold requirements of the mainframe computer market are broken. The introduction of microprocessors not only better met the potential demand for mainframe computers, but their mechanical design could also be applied to the personal computer market; the more the computer improved in terms of features and price, the more likely it was that customers would convert it into a commodity, and it was a key factor for companies to master innovative designs that could meet the needs of different customers through similar creation.

4. The place of similar creation in repetitive and divergent histories of computers.

Replication is an important feature of the cognitive process and is a precursor or basis for knowledge transfer. From the perspective of innovation, class-creating activities are reflected in the replicative and pluralistic history of computer technology. Many integrated circuit computer companies, in their infancy, entered the mainframe computer market by designing with imitation. Later, when microprocessor companies entered the PC market, some of the IC companies producing mainframe computers also began to use microprocessor technology in the face of competition and entered the PC market as well. This type of creative activity leads to industrial evolution, and indeed replication is an important means of corporate evolution. For example, IBM, a dominant integrated circuit company, entered the mainframe computer market fairly quick, and then even after new companies entered the industry, IBM was able to hold on to its computer market share, partly because IBM was able to master microprocessing technology and create a class in a fairly short period of time, thus entering the PC computer market and achieving not absolute dominance but a fairly good performance in the PC market. The company was able to enter the PC computer market and achieve a good performance in the PC market, although not an absolute advantage.

The history of the computer industry reveals the following roles of class creation in the replication model; first, early purchasers of computer products felt that they were locked in (replicating themselves) by a full-scale design and production company such as IBM in order to upgrade (mainly for special software that had to be updated to improve the computer's performance), which made it difficult for other new companies to enter this market. This makes it very difficult for other new companies to enter this market, and a company that already has a high market share will always be able to attract new buyers. Second, when new technologies are first created, those companies using older technologies are still considered advanced and industry leaders. In the replication model, when the first microprocessor company first enters the market, those industry leaders with foresight immediately look into replicating the new technology (copying others). Third, while the industry dominant company's enormous resources allowed it to quickly undertake massive research and development and advertising to catch up with the early lanes into the PC market. However, because a large number of firms in the PC market produce products that are compatible and because customers are very sensitive to computer features and especially to price, the dominant firm is not able to lock them out completely in the PC market (copying is ineffective), so class creation activities have to be focused because the quality factor in the PC market is high while the specialized market share factor is low.

The role of class creation in the historical pattern of computer dispersion is also very distinct. The continued dominance of certain large companies that dominated the mainframe computer market, such as IBM, in the PC market is attributed to two factors: one is the factor of repeated customer purchases or "lock-in" (replication), and the other is because IBM mastered new technologies fairly quickly before "strong competitive "strong competitive" new technologies before they emerged, and to capture new markets through diversification (partial transformation).

In the diversification process, class creation also requires venture capital. Data show that when early investments in microprocessor companies were small, fewer companies entered the PC market, none entered the mainframe computer market, and the process of technological diversification began late. This is because new entry funds play an important role in facilitating the adoption and diversification of technology by the original firms in the industry,

and through early investment, those large computer firms are able to adopt microprocessor technology and open up new PC markets. share in different specialized markets will increase.

5. The dynamics of similar creation

When transistors and microprocessors were introduced, computer companies had to learn to design computers that could use these components effectively. These designs were both true creations, but more often they were class creations. As an important part of innovative activity, class creation is driven by the innovative individual's perception of multiple factors.

5.1 The dynamics of venture capital

During the pioneering phase of new products, such as the introduction of transistors, many companies were seized by eager venture capitalists and initial funds were spent on research and development. Investing in R&D results in experience and increased competitiveness in the application of new technologies. This is a learning process and thus a process that makes extensive use of class creation. All companies are on the same starting line, i.e. at ground zero, in terms of their design capabilities. Companies then forecast the difficulty of the new technology, the cost of reducing the computer, and the market prospects, and then set the research and development budgets allocated to each project accordingly to improve the functional performance of the computer. After the early stages, companies will do different things (diversify) to obtain computer design ideas with different characteristics.

If a company spends its initial venture capital before it has developed a promising product, then it has failed. However, if the company can manage to get its design into areas where customers are willing to buy it, then it is a newround game: the company can continue to invest funds from its income in research and development, and the company can survive into a new era, for example, from the transistor era to the microprocessor era.

5.2 Market dynamics

It is generally said that the more advantages of the machine the more it sells. We measure the effectiveness of innovation activities based on how many products are purchased by customers in the market segment, and these products

must meet the threshold needs of customers.

If there is more than one type of computer that meets the customer's requirements, it is important to analyze not only the functional merits of the computer, but also other relevant market variables. For example, brand effects, customer loyalty, and advertising, among others. These concepts reflect important elements of the historical evolutionary model of computers.

The broad market for computers can be subdivided into a number of smaller markets, consisting of various small individual markets as well as group markets of the same nature. The market share variable reflects both the merits of the computer and the branding effect, as well as advertising for product replacement.

Customers in a particular market buy a particular computer, first of all, there is only one type of computer that satisfies the needs of the customer, and each -If there are many brands that pass the threshold requirements, customers will buy the brand with better features. However, if the brand effect and advertising effect is higher, the computer with high level will be beaten by the computer with more market share or the computer with more advertising. However, if the branding and advertising effects are higher, computers with higher levels of performance will be beaten by computers with more market share or more advertising. Therefore, a significant portion, or even a major portion, of the innovation activity is spent on marketing activities, such as Microsoft's bundled sales and other promotional activities (which also led to the U. S. Department of Justice's prosecution of its industry for monopolization). (which also led to the U. S. Department of Justice's prosecution of its industry monopoly).

5.3 Technological competitive dynamics

As the industry evolved, the older companies, such as Transistor, did not put up "barriers to entry" for new microprocessor companies that wanted to enter the personal computer market, but rather put-up huge barriers in the mainframe computer market. This is because, while microprocessor technology can meet the needs of the mainframe computer market, transistor technology, which dominates this market, has long been able to meet or even exceed the minimum requirements of customers. Secondly, transistor companies not only occupy a considerable market share, and also do a lot of advertising, so for those who want to enter such as the mainframe computer market of new companies is also unfavourable. In fact, microprocessor companies entering this market is really not

very good. This is because large computer companies have adopted microprocessor technology. For example, IBM has used this technology to enter the personal computer market. Thus, the competitiveness between companies is cumulative, and the effectiveness of today's designs is based on the achievements of yesterday. On the one hand, companies have to do better and better, and on the other hand, they encounter more and more difficulties in developing new things. Many companies encounter great difficulties in developing new technologies, and some companies in particular are at a disadvantage when competing with companies that have already adopted new technologies because they cannot change them quickly enough.

5.4 Drives of transformation

While older transistor companies were able to apply microprocessing technology to mainframe computer designs, it was both time consuming and costly high. New companies could start using microprocessing technology for advanced computer design. Therefore, the probability that the old company will adopt the new technology is a function of two variables, the first being how far the new technology can advance, and the second being whether the company will fail if it does not adopt the new technology and instead moves forward on the same path.

The disadvantage of an old transistor company moving to a new technology is that, due to lack of experience, it can only achieve the average medium level of a microprocessor company in adopting a new technology and must cover all the costs of the transition before it can start a new design, production and marketing of mainframe computers based on microprocessor technology. The advantage is that the transistor company has a budget for R&D and can cover the cost of R&D through current revenue streams. Once the old transistor company adopts the new technology, it can design and sell products in the personal computer market. Generally speaking, the old design technology is not suitable for application in diversification, therefore, the class creation activity consists of two types of transformation, one in which a company that already has - one technology switches to another technology, and the second in which a company that already exists in the industry The second is when companies that already exist in the industry diversify to continue their growth. IBM, for example, diversified its technology by setting up a new subsidiary, PC. Imitative learning and creation-like activities will continue to be the main source and driving force

of branch The main source and driver of the company's development will be imitative learning and creative activities.

6. Conclusion

Innovation is the most important issue of the new economic era, and the computer industry is the front-runner of the new economic era. By analysing the history of the evolution of the computer industry, we can see the role of innovation in the advancement of the industry. Many companies that had been in the Many companies that had been leaders in the industry were not able to seize the new market share brought by innovation in the fierce competition in the industry, and thus lost their advantages in the industry. The industry has lost its dominant position because it was unable to capture the new market share brought about by innovation in the highly competitive industry.

This paper discusses the background and role of class creation in three ways, starting from the history of the development of the computer industry.

- the perception of market demand characteristics
- Perception of technology adoption and diversification
- Perception of market entry

The first point is the important role of demand on market structure and technological innovation. These four reflective attitudes determine whether people can innovate and seize new markets and demands. These four reflective attitudes determine whether people can innovate and seize new markets and new demands; among them, the positive type is the background for the creation of the class, while the last three attitudes predict the industry. The latter three attitudes predict the gradual loss of technological leadership and market share of existing companies in the industry.

The second point highlights two diversification strategies used by computer companies in class creation: one is to create new companies to master the use of new technologies: the second is to create new companies to see if they can enter directly into new technologies. to master the use of new technologies: the second is to create new companies to see if they can directly enter the new technologies The second is to build new companies to see if they can enter directly into new markets opened up by new technologies and start innovating. These two

strategies are inseparable from people's perceptions of their own capabilities and environmental conditions. According to the history of the development of the computer industry, the second approach is much more difficult.

The third point illustrates the importance of entering the industry. This is a challenging point for both new and established companies. Here the venture capital market plays an important role, i. e., without venture capital and entrepreneurship, class creation is not without venture capital and entrepreneurship, class creation would not have been possible.

To sum up, class creation is the core force of innovation, the most important source for the creation of new technologies and the birth of new companies to meet market needs. At the same time people's cognitive results generate attitudes in front of new markets, new opportunities; the presence of venture capital markets in the external environment; and entrepreneurship are also essential elements. Only by combining class creation and these elements can computer companies seize new technologies, open new markets, take a dominant position in the industry and become industry leaders.

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